PATENTS FOR INVENTIONS.

ABRIDGMENTS

OF

Specifications

RELATING TO

HARBOURS, DOCKS, CANALS, &c.

A.D. 1617–1866.

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PREFACE.

The Indexes to Patents are now so numerous and costly as to render their purchase inconvenient to a large number of inventors and others, to whom they have become indispensable.

To obviate this difficulty, short abstracts or abridgments of the Specifications of Patents under each head of invention have been prepared for publication separately, and so arranged as to form at once a Chronological, Alphabetical, Subject-matter, and Reference Index to the class to which they relate. As these publications do not supersede the necessity for consulting the Specifications, the prices at which the printed copies of the latter are sold have been added.

The number of Specifications from the earliest period to the end of the year 1866 amounts to 59,222. A large proportion of the Specifications enrolled under the old law, previous to 1852, embrace several distinct inventions, and many of those filed under the new law of 1852 indicate various applications of the single invention to which the Patent is limited. Considering, therefore, the large number of inventions and applications of inventions to be separately dealt with, it cannot be doubted that several properly belonging to the group which forms the subject of this volume have been overlooked. In the progress of the whole work such omissions will, from time to time, become apparent, and be supplied in future editions.

This volume contains Abridgments of Specifications to the end of the year 1866. From that date the Abridgments will be found in chronological order in the "Chronological and "Descriptive Index" (*see* List of Works at the end of this book). It is intended, however, to publish these Abridgments in classes as soon as the Abridgments of all the Specifications from the earliest period to the end of 1866 have appeared in a classified form. Until that takes place, the reader (by the aid of the Subject-matter Index for each year) can continue his examination of the Abridgments relating to the subject of his search in the Chronological and Descriptive Index.

This series embraces, in the first instance, inventions relating to harbours, breakwaters, piers, and all kinds of docks, wet, dry, and floating; including piles, pile-driving, pile-drawing, and pile-cutting machinery; also machines used for submarine construction, cofferdams, and caissons; but not diving-bells or divers' dresses.

Dredging machines are contained in this series; but machines for raising embankments and excavating machinery (other than dredging) for making cuttings are included only when mentioned as intended for canals, &c. A larger collection of the latter machines (excavators for general use) will be found in the series relating to "Raising, Lowering, and Weighing;" but for such as are specially intended for railway-making the reader should refer to the series entitled "Railways."

The construction and mooring of buoys, for harbours or for beacons, are included; but buoys and "balloons" for recovering or raising submerged property are excluded, as also are life-buoys and pontoons.

Lighthouses are included, but not lamps for the same, which will be found in the series devoted to "Lamps, Candle-"sticks," &c.

Cranes for wharves and piers are omitted, but will be found in the series entitled "Raising, Lowering, and Weighing."

Neither the general preservation of marine structures by the use of cements, paints, and similar substances, nor the materials used for coating or preserving timber, iron, or stone are included; for such see the series respectively entitled "Stone, Marble, Slate, and Cements," "Paints, Colours, and "Varnishes," and "Shipbuilding;" to which latter series especially reference should be made for methods of sheathing and preventing or counteracting galvanic action on immersed iron structures, such as ships, buoys, graving docks, &c.

The construction of canals is included, and all inventions connected therewith, such as sluices, locks, &c., but not inventions relating to the propulsion of barges or boats on canals, which will be found in the series of "Marine Propulsion."

The embanking of water-courses and construction of reservoirs are likewise included.

February, 1876. B. WOODCROFT.

INDEX OF NAMES.

[The names printed in *Italic* are those of the persons by whom the inventions have been communicated to the Applicants for Letters Patent.]

HARBOURS, DOCKS, CANALS, &c.

HARBOURS, DOCKS, CANALS, &c.

A.D. 1617, July 21.—No. 3.

GASON, JOHN.—" A more apt, com̄odious, and beneficiall " meanes for and concerning the framing, contriving, and " making of locks, sluces, bridges, cuttꝭ, cranes, millꝭ, dames, " and other invenc̄ons and additc̄ons most fitt, necessary, and " convenient for grinding of corne, raising of water, making " of rivers, streams and waters navigable and passable for " boates, keeles, and other vesselꝭ to passe from place " to place."

The inventor was to enjoy all the profits arising from his invention during twenty-one years, on condition of a " yerelie " rent or farme of fortie shillingꝭ " being paid into the Exchequer.

[No Specification enrolled. Letters Patent printed, price 4*d.*]

A.D. 1618, July 16.—No. 9.

GILBERT, JOHN.—A " new engine or instrument called or " termed a water plough, for the taking upp of sand, gravell, " shelues, or banckes out of the river of Thames and other " havens, harbors, rivers, or waters, wherewith they are " choaked, for the freer passage and safetye of shipps and " other vessels."

This invention also relates to an " engine or instrument for " the raysing of waters in a greater quantitie, and to a greater " height than heretofore hath bin knowne or practised in these " our realmes, which said engin for raysing of waters is to " be moued and driuen either by some current or streame " of water, or for want thereof by strength of horses, and " is verie necessarye for the drawing and drayning of coale " pitts and other mynes." The above Letters Patent were surrendered on the 7th day of November, 1629.

[No Specification enrolled. Letters Patent printed, 4d.]

A.D. 1619, May 23.—No. 13.

SHOTBOLTE, JOHN.—" A pfecte, true, and exacte way of " makeing, amending, and repairing our royall highway and " roades, as alsoe any other pticular waies and passages what- " soever; and alsoe for the speedy erecting, raising, newe " makeing, amending, and repairing of the moundes and " banckes of the sea, greate rivers, or other waters that may " overflowe, surround, or any way endaunger the waies " or any lands or groundes adioneing or neere to such waters " as aforesaid; as alsoe for the makeing, amending, clensing, " scowring, sinking, making cleane, and repaireing of pondes, " stanckẽ, dāmes, pooles, draines, rivers, and all manner of " watercourses whatsoever, and that by the vse and helpe " of certaine strong way ploughes, way harrows, land stearnes, " scowrers, trundlers, and other strong and massy engines."

[No Specification enrolled. Letters Patent printed, 4*d*.]

A.D. 1619, June 2.—No. 14.

GASON, JOHN.—"The sole practise of certeine engines & " invenc̃ons for raising of waters and making rivers " navigable."

[No Specification enrolled.]

A.D. 1626, September 5.—No. 34.

TYPPER, ROBERT, and GASON, JOHN.—"The making of " newe sluces, lockes, bridges, cuttẽ, draynes, rivers, milles, " dammes, havens, streames, and other navigable waters, " banckes, walles, and other fitt, necessarie, and convenient " engynes, instrumentẽ, and invenc̃ons to be by them put in " vse, and wrought with by water or by waterworke, or by " winde, man, or horse, as occasion shall require, not hereto- " fore putt in vse by anie other within our said realme and " dominion of Wales after their manner of invenc̃on or " working, or els by the making vse of, turning, chaungeing, " or altering of such other channellẽ, water courses or sluces " which are already made, as the severall cases shall require, " for the pformance of the said worke."

[No Specification, enrolled. Letters Patent, and Agreement printed, 10*d*.]

A.D. 1627, January 3.—No. 36.

SPENCER, Arnold.—"To make other rivers, streames and "waters navigable and passable for boatẽ, keeles, and other "vesselẽ to passe from place to place, which heretofore hath "not been practized or put in vse by anie others within anie "of our realmes and dominions."

The patentee is to have the sole right of applying his Invention during eleven years, conditionally on the "rent or "sōme of five poundẽ" being paid into the exchequer. Moreover, he is to enjoy "all the ꝑffittẽ and benefittẽ of all "the rivers by him" "to be made navigable within the "terme of eleaven yeeres aforesaid," "from the end and "expiracõn of the said tearme of eleaven yeeres for and "dureinge and vnto the full end and tearme of fower-score "yeers from thence next ensueinge," conditionally on paying the yearly rent of five pounds for every river rendered navigable.

[No Specification enrolled. Letters Patent printed, 4d.]

A.D. 1631, July 8.—No. 55.

GILBERT, John, and FREESE, James.—This invention relates "to engins or instrumentẽ tearmed or called water ploughes" "for the takeing vpp of sand, gravell, shelves, and banckẽ out "of the river of Thames, and other havens, harbours, rivers, "or waters within our realme of England, and dominion of "Wales, wherewith the streames or channells thereof are "streightned or choaked, that shipps and other vessels may "have the more free passage and safety."

This invention further relates to "engins or instrumentẽ "for the raising and drawing of waters, pittẽ, and groundẽ."

The two machines above alluded to are the same as those mentioned in No. 9 of the year 1618.

The said former Letters Patent were surrendered up, cancelled, and made void, to the end and purpose that new Letters Patent should be granted—being the present Letters Patent— "of all and singuler the premisses mencõned in the said former "Lr̃es Patentẽ, with further meanes, interest, power, privi- "ledge, and authority, for the setting on worke and full "ymployment of the said engine, and all other engines heer- "after to be made, or by him further to bee invented for the

" like vse and service, for and duering the terme of one-and-" twenty yeers."

[No Specification enrolled. Letters Patent printed, 4*d.*]

A.D. 1633, May 31.—No. 64.

HILL, Symon.—" A newe and speedye waye, not practised by " any other heretofore, for the takinge awaye of all such " barres or beddes of sand, althoughe they bee eight, nyne, " or tenne foote deepe vnder water."

[No Specification enrolled. Letters Patent printed, 4*d.*]

A.D. 1634, January 7.—No. 66.

DERICKSON, Christian.—" Spring doores to be placed on " the landȩ side of such sluces as are made in sandy rivers " for the forcible scowring and effectual gayning and maine-" tayning of any outfall at sea ; " allsoe " tunne myllȩ for the " raising of water out of sluce pittȩ or other workes subiect to " invndacõn, both which ingenious woorkes are very vsefull " in drayning of fennes and marishe groundȩ, and have never " yet been practiced in any of our domynions."

[No Specification enrolled. Letters Patent printed, 4*d.*]

A.D. 1636, April 27.—No. 92a.

VAN BERG, Sir John Christopher.—There is no formal title to this invention, but the Letters Patent state that the invention consists in " diverse mechanicke instrumentȩ and frames " operating by waightȩ, soe to bee fitted and ordered that the " force and strength of them may bee augmented or diminished " either in regard of the instrumentȩ themselves, or in respecte " of the number of workemen to bee ymployed aboute them " accordinge as occasion or necessitie shall require."

Amongst the subjects treated of in this document, the following may be set forth in this place :—

" Alsoe instrumentȩ for the advantagious removeinge or " takeing forth sand or earth out of shallowe places either att " sea or in ryvers, that the waters may bee deeper and lesse " dangerously navigable, and if there bee any dikes or trenches " vnder the water to breake and even them speedilie and force-" ably, and to remove and caste forth the earth and materiallȩ " thereof."

"Lastly, another invencon especially vsefull in and aboute "the building and repayreing of churches and greate edifices, "howses, shipps, and the like, for the better saveinge the "excessive charge" the inventor "hath hearde is expended "in scaffoldę in and about the same."

[No Specification enrolled. Letters Patent printed, 4*d*.]

A.D. 1638, December 11.—No. 122.

SPENCER, Arnold.—To cutt and make lockes, sluces, "bridges, cuttę, dammes."

These Letters Patent were an extension of the term granted for the same invention on January 3rd, 1627 (No. 36). The extension was for twenty-one years, subject to the payment "for every of the said rivers to be made navigable, the rent "or sōme of five poundę." In addition, the inventor is empowered to enjoy all the profits arising from the rivers rendered navigable during the continuance of his Patent, for a "terme of fowerscore yeares, the severall yearly rentę of "five poundę a peece of good and lawful money of England "for every such river," being, on his part, paid into the exchequer.

[No Specification enrolled. Letters Patent printed, 4*d*.]

A.D. 1666, May 16.—No. 150.

BAYLIE, Lewys.—"A certeine machin or engine for the "more expeditious cutting, digging, or making navigable "rivers, draynes, lynes, or trenches, or for cleansing of any "rivers racked vp or obstructed in their currentę.

[No Specification enrolled. Letters Patent printed, 4*d*.]

A.D. 1672, February 26.—No. 168.

LEE, Edward.—"Severall new engines for the cutting new "rivers, and for the deepning, clearing, and removing sands, "gravell, stones, and other earth in rivers, and in making "those navigable that are choaked vpp."

It is stated that models of these engines had been presented to Prince Rupert. The Letters Patent were granted subject to the yearly payment of "the rent or summe of twenty "shillings of lawful money of England."

[No Specification enrolled. Letters Patent printed, 4*d*.]

A.D. 1673, February 20.—No. 169.

BAYLY, Lewis.—"A new engine for the cleansing and dig-" ging rivers, harbors, and havens to any depth vnder five-" and-twenty foote at low water."

Annexed to the Signet Bill is "a draught or scheme where-" of, fairely drawne vpon vellome," but no description is appended. The drawing represents a wheel, round the circumference of which are affixed a series of scoops. It is probable that this wheel could act in a manner similar to the dredging machines now in use.

[No Specification enrolled. Signet Bill printed, 10d. Drawing.]

A.D. 1674, December 24.—No. 177.

AERSKIN, William.—"A certain new engine or machine" without oares, for the safe towing ships and vessells out of" and into rivers and harbours, when they are obstructed by" contrary windꝭ, which may tend very much to the service" of our navy royall, as well as the shipps and vessellꝭ of our" subjectꝭ."

These Letters Patent were granted for a term of fourteen years for England and Ireland. There is no mention made in them of a yearly rent or sum to be paid to the crown, as was customary in the Letters Patent of that period.

[No Specification enrolled. Letters Patent printed, 4d.]

A.D. 1677, March 15.—No. 196.

BAYLY, Lewis.—"A certaine new engine, working with" nettꝭ, which is found a more easy & expeditious way than" any heretofore practized for the taking vp from vnder" water, gravell, sand, shingle, & other soyle fitt for ballast-" ing shipps & other vses, & is capable of removing sandꝭ," shoales, & other obstruccons in rivers without makeing" holes as ginnes formerly have done, or doing anything" ꝑiudiciall to the navigacon; and further that he hath alsoe" invented, erected, & experimented a certaine other engine" now imployed vpon the peere head of Great Yarmouth, for" the better driving in piles for securing peeres & defences" against the violence of the sea."

It is stated that the inventor has "erected & experimented "in our river Thames" the first of his new engines. He is empowered to "erect, vse, teach, exercise, & putt in practice "the said two severall new invenčons" "in any port haveing "harbors, rivers, creekes, or other places whatsoever, within "our kingdomes of England & Ireland, & all & singuler the "dominions & territories therevnto belonging, and alsoe shall "& may receive, take, & enioy all the benefitt℈, profitt℈, "comodities, and advantages of & by the said two severall "new invenčons, & either of them, to be had, made, acquired, "or gotten to his" "ᵱper benefit, vse, & vses," for the term of fourteen years, and without the payment of a yearly rent to the crown.

[No Specification enrolled. Letters Patent printed, 4d.]

A.D. 1682, November 21.—No. 223.

WINDSOR, THOMAS LORD, PITT, GEORGE, and DRAPER, CRESHELD.—"Makeing of wett harbours and dock℈ to hold all "sort℈ of shipps, to lye tenne, twenty, thirty, or forty foot "above high-water marke."

The inventors are stated to have managed after several experiments, and by employing engines, "and with the helpe of "three men onely, to take the greatest shipp of burthen out of "the river of Thames into the said harbour, tenne, twenty, "thirty, or forty foot above high-water marke, and by the "said meanes deliver any shipp into the river of Thames "againe, and canne alsoe deliver the greatest shipp from the "stock℈ into the said harbour, and from the harbour vpon "the stock℈ again." The Letters Patent were granted for a term of fourteen years, free from any condition respecting an annual payment.

[No Specification enrolled. Letters Patent printed, 4d.]

A.D. 1693, April 27.—No. 320.

POYNTZ, Captain JOHN.—"Scowring rivers, harbours, chan- "nells, creekes, roades, rivuletts, milldams, &c., which are "dammed, choaked, and almost filled vp with sand, mudd, "gravell, &c."

There is no information given in the body of the Letters Patent of the *mode or machine* whereby the above-mentioned

objects are to be effected. The grant of Letters Patent is not clogged with any stipulations respecting a yearly payment; it is made for a term of fourteen years, and applies to "our "kingdome of England, dominion of Wales, and towne of "Berwick-vpon-Tweed, or any other our dominions."

[No Specification enrolled. Letters Patent printed, 4*d.*]

A.D. 1706, June 6.—No. 377.

ALDERSEY, Robert.—"A floating dam," by means of which the inventor "is able to carry barges, lighters, and "other vessells over the greatest flatts and shallows in any "navigable river; which said machine hath been tryed before, "and had the approbation of severall the most eminent ma-"thematicians."

[No Specification enrolled. Letters Patent printed, 4*d.*]

A.D. 1712, April 3.—No. 391.

POWNOLL, Israel.—"A new engine or machine for taking "vp of ballast, sullage, sand, &c., from twenty foot deep, "more or lesse, vnder water, with a new kind of boat or "vessell with a convex or rounding deck with ports on each "side to receive and carry off what the engine brings vp, or "as may be otherwise employed for performing its office more "expeditiously than any before invented, which will be of "very great vse in cleansing rivers, harbours, &c., which "stand in great need thereof by their frequent shoalding by "shelves or banks arising from the sullage washed from "shoares by the freshes, as also from the marshes, creeks, "&c., by the flux, reflux, and setts of the tydes in tempestuous "weather and rapid seas fretting and wearing down the banks "which have rendred many ports vnnavable, and seem to "threaten others if not timely prevented"; "the said engine "differs from any other for the said vse by the scoops, "buckets, or vessells being so ordered and contrived on the "end of a long pole or boom that they have a free moc̃on "towardᵹ and from the center of a wheel they play by, so "that they will humor or answer any unevenness of ground "or any variable depth of water within the reach of its shift-"ing moc̃on, which makes it capable of performing its office "*in places* where the tydes of freshes ebb and flow, and not

"only in standing waters; the said engine may be made to "work with one large wheel or two, fitted to a vessell or "vessels prepared accordingly."

[No Specification enrolled. Letters Patent printed, 4d.]

A.D. 1724, November 4.—No. 472.

BUMPSTED, Robert.—"A new invented engine or machine "for raising water from any depth to any height as might be "required out of pits or mines, and for the better supplying "of cities, towns, &c., with water than had been done hereto- "fore by any; likewise for floating ships out of docks at any "tide, which now are obliged to stay for a spring tide, which "might prove detrimental by their long stay: that it would "also draine and cleanse rivers, docks, or ponds, and carry "off the mud with it, and would likewise drain lands over- "flown with water, with wonderful expedition, and would "supply dry and barren lands with water that now lye waste "and vseless, so that those lands might be cultivated and "numbers of poor people be employed and earn their daily "bread which were burthensome to their respective parishes; "that likewise trenches might therewith be drained with "such expedition that it would throw out the water as fast as "it came; that it would also work a mill or mills where no "running streames are, and without wind or the twentieth "part of any additional power as in such cases are required, "and is fit for sundry other beneficial vses."

[No Specification enrolled. Letters Patent printed, 4d.]

A.D. 1744, January 5.—No. 595.

GREGORY, John.—"An engine for draining of fens or "marsh lands that are overflowed with water, to be worked "sometimes by wind when that serves, and when that fails to "be worked by horses; and the same engine with a little "alteration, will raise ballast out of rivers that are choaked "with sand or gravel, and thereby make them navigable, for "which purpose the said engine is to be worked with men "and horses, and not by wind, and by a drag, contrived to "work with pulleys, will clear the soil from any wharfs that "are obstructed thereby."

The description of this invention is comprised in references and notes upon the sheet of drawings appended to the Specification.

Barges work drags, and, in case the sides of the river are not available, a capstan is placed in each barge (one barge being on each side of the river), so that horses can work the arrangement. The drags move across the river, by means of pulleys, so as to rake up heaps of ballast from the bottom of the river to the sides.

The arrangements in a river to work a water wheel as a motive power for the said "engine" when it is required to raise water, are certain gates or sluices to cause a current of water to go to the wheel, and a cutting of the banks of the river to accommodate the axes of the wheel.

A method of working the machine by means of horses is shown in detail, also a windmill arrangement. Scoops to raise the ballast are spirally disposed round the driving axis. "Gripes," or cupped scoops are worked by cranes, capstans, and pulleys. The whole machine is placed in a barge and has a drag for levelling ground under water. A ballast barge, a hollow wheel to raise water, and a chain wheel with buckets are shown in the drawings.

[Printed, 10*d*. Drawing. *See* Rolls Chapel Reports, 6th Report, p. 121.]

A.D. 1744, January 21.—No. 598.

PANTIN, Lewis.—"An engine or machine for the raising "and taking up of ballast, mudd, gravel, and soil from the "bottom of rivers, harbours, and other waters, or the shoals "and sand banks thereof, and for the better cleaning, deep-"ening, and making the same navigable, and also for the "driving of pyles either in the water or upon land."

The drawings show the said machine driven by horse power. The description of the invention is comprised in notes and references on the sheet of drawings.

In the pile-driving machine, a drum winds up the rope which passes over pulleys, and is connected to a follower that takes hold of the ram by means of a pair of tongs. The ram is mounted between vertical guides, and when it is raised to the top of its travel, certain fixed inclined planes open the tongs and discharge the ram. To prevent the horses falling when the ram is discharged, a fly-wheel is on the axis of a trundle which is worked by the drum wheel. A rope with a counterpoise is wound on a spiral barrel connected with the drum "to hinder the follower from accelerating when it falls "down to take up the ram."

Cranes for raising ballast are mounted on the framing of the pile-driving machine. These are worked by means of a rope round the aforesaid drum, and by latches, catches, and levers.

[Printed, 10*d*. Drawing. *See* Rolls Chapel Reports, 6th Report, p. 121.]

A.D. 1747, March 21.—No. 620.

ROWE, Isaac.—A "new machine with pumps, not requiring " either box or sucker, as in others now in use, which will " raise large quantities of water from great depths, and dis- " charge the same through large boxes, at great heights or " distances out of mines, ships, docks, and overflowed lands, " & is also applicable and usefull in the working any kind " of mills where little or no water is to be had, or in stand- " ing pools, or upon dry land, without horse, fire, or wind, " & for many other purposes."

The description of this invention is comprised in the notes and references on the drawings.

A set of four pumps, with solid plungers, is worked by a water wheel. Wheels on the driving axis, the circumferences of which are partially cogged, work arcs at the extremity of the pump levers.

To work a water wheel by means of a pond or reservoir of still water.—A wheel with vanes is rotated by hand labour and throws "the power of the water" with violence against the "hollow pans" of the water wheel. The reservoir is divided into three long and narrow channels parallel to each other, and the motion given to the water in the central channel causes it to return along the exterior channel, and thus to circulate in a constant stream. The water wheel is apparently employed as a motive power.

To set mills in action on land, a lever or "brake" is used to give motion to a horizontal fly-wheel shaft which works a trundle on the vertical shaft carrying the mill stone.

[Printed, 1*s*. 4*d*. Drawings. *See* Rolls Chapel Reports, 6th Report, p. 122.]

A.D. 1752, February 11.—No. 668.

COLEMAN, Edward.—"A machine which works by wind, " water, or horse," "for draining of lands which are flooded, " or for flooding lands where there be occasion, or for supply-

" ing cities or towns with water," "or for making rivers " navigable, taking the ground up in a quite level manner, or " for the deepening of harbours, basons, moles, or wet docks," or for other purposes.

When this machine is worked by wind, eight sails are fixed to four stocks, the wind having power only upon one side of the sails; the returning sails fly "up in a quadrental form." The driving shaft carries lantern wheels, spur wheels, "worms " and cant wheels." When worked by horse, the horse goes into a large wheel and pulls at a post. When the machine is worked by water, the water wheel has "spooners, wallows, and " spur wheels, one or two of which may be placed in a barge " which hath a well & bridge through which the tide or " current runs which works the machine. They may also be " fixt between two barges, float or stage, on the water; and " when it is still water it may be worked, by horse as above. " The ballast is taken up sometimes by a range of receivers " stretch'd out to the bottom of the river, which go continually " round; & sometimes the said mill or wheel is worked with " long poles crossways, which are brought up & let down be- " tween two sheives playing in a roll on the outside of the " barge; and the ballast so taken up by either of the above " means is discharged into barges on both sides at one time, " with gratens & false bottoms, which, opening quickly, dis- " charge themselves of their burthen. The wheels to be used " for raising water are hollow, taking up the water in a semi- " circular or spirial form, and having in them fixt receivers, & " sometime move with swivels, and may be worked with a cog " wheel, rope, or chain, either by wind, horse, or water."

[Printed, 4*d*. No Drawings. *See* Rolls Chapel Reports, 6th Report, p. 126.]

A.D. 1753, April 12.—No. 682.

LIDDELL, Richard.—"A new sort of machines or vessels " for the removal of or carrying away earth, ballast, sand, " rubbish, rock, stones or any other kind of matter that now " are or may hereafter become a nusance to any port, river, " harbour, creek, or inlet in any of his said Majestie's do- " minions."

On the drawing, by way of notes and references, a description is given "of a vessell design'd to receive on board sand

" ballast dirt, &c. from on board ships or from shallows in
" rivers or harbours, and to be navigable with sails to carry
" the same into the deep sea and there drop her lading through
" port holes made in the bottom and to return exclusive of
" manual labour in heaving it over the sides of the vessell."

"Principalls.—The midle of the inside of the vessell that is
" to contain the ballast must be form'd somewhat like a
" hopper that conveys the corn to the grinders of a mill. This
" hopper must contain as many cubick feet of space as is
" equal to the quantity of ballast design'd for a proper loading.
" That there be a port hole or more through the bottom for
" the ballast to discharge itself into the sea and a port lidd or
" shutter to fasten up or lett go at pleasure. That the inside
" of the hopper and passage through the bottom be equally
" staunch and tight as the outsides of the vessell.

"That the contents of the cavity contain'd in the ends and
" sides of the vessell that encompasses the hopper, be in
" quantity so much as is sufficient to bear up the vessell,
" utensils and loading to a convenient height to answer the
" purpose of navigation, and that the whole be so disposed as
" the vessell may be govern'd with her sails light or loaded
" equal with other small vessells in common."

[Printed, 8*d*. Drawing. *See* Rolls Chapel Reports, 6th Report, p. 127.]

A.D. 1758, January 12.—No. 720.

BRIDGE, Thomas.—" A new machine for making rivers
" navigable."

The description of this invention is placed upon the sheet of drawings and consists partially of references thereto.

The said machine consists of a floor and superimposed framing apparently placed on uprights above the river.

The framing carries two cranes, one at each extremity, besides a windlass and pulleys. One crane is employed to draw up goods by means of a cradle, the rope from which passes over the crane pulleys to another pulley on a transverse shaft at the top of the framing. The said shaft also carries a smaller pulley, from which depends a rope that passes through the floor to a bucket. "A rill of water, running under the
" floor" "falls through an opening into the bucket," "which
" when it is full descends" "by its weight and brings up the
" cradle loaded with goods;" when the bucket has fully de-

"scended, a valve in its bottom (that opens upwards) strikes against a pin, thus allowing the water to run out of the bucket while the cradle is unloading. "When the bucket is empty, "the unloaded cradle descends for more goods and brings up "the bucket to be filled again, which then brings up the "loaded cradle as before."

The drawing shows a catch working in a ratchet wheel on the transverse shaft; this prevents the going back of the said shaft and the descent of the cradle till the catch be pulled out of the wheel by a rope. This arrangement provides for the bucket losing its water before the cradle is emptied.

The above-mentioned windlass assists "in bringing up the "cradle when it may happen to be too heavy for the bucket."

[Printed, 6*d*. Drawing.]

A.D. 1760, November 27.—No. 756.

DE LINIERE, Francis Xavier d'Arles.—"A machine upon "new principles for exerting the power of men" applicable amongst other purposes to "driving piles, works in canals of "communication, stirring and raising of earth, clearing of "rivers and sea ports of sand, mud, and dirt, which obstruct "navigation."

A machine to illustrate this invention consists of a fixed framing which allows of the vertical vibrat in of two closely-placed equipoised frames. The vibration of these frames is communicated, by means of ropes passing over a pulley, to two weighted levers which work the catches of a winch which raises the weight. The equipoised frames are so made that they can rise and descend alternately to the extent of six or seven inches; they are worked by the right and left foot respectively of the men employed, the right foot of each man bearing on one frame, and the left foot on the other frame. To assist in this action, a bar placed across the fixed framing of the apparatus carries pins to be grasped by the hands of the men. A check or catch, of which one end is fixed upon a moving centre, is intended to prevent the accidental turning back of the wheel or winch, and the running down of the weight already raised.

Modifications upon this plan may be used.

[Printed, 4*d*. Drawing. *See* Rolls Chapel Reports, 6th Report, p. 131.]

A.D. 1763, March 3.—No. 785.

BURNE, Charles.—Two kinds of "keels or vessels depending "partly upon each other, by which ballast may be taken out "of ships, sand beds in rivers taken up, harbours deepened," and "banks of sand and gravel at the entrance of ports "removed."

From the said entrance of ports or havens, the said ballast is conveyed to sea into deep water.

The carrying keel is made to carry "a great burthen at a "little draught of water," to have a low side and to go well to windward with a sail; also to have a contrivance to get quit of her loading without much labor, and to have a mast that can be struck with ease.

The dredging keel is a low broad vessel containing a wheel about four or five feet diameter, and a start or pole about ten feet long to be turned by horses; it has a sharp bow, and is to lay fast moored at the place where the ground is to be taken up. The carrying keel is to be fastened to the said dredging keel, "when dredging to receive the sand and ballast."

In the carrying keel, the drawings show spouts declining from the deck to the bottom of the ballast port. There are cranes at the side of the vessel to direct the dredges, which are worked from the dredging keel by means of ropes that pass round the above-mentioned wheel.

Lee boards may be hauled up or let down through the keel.

[Printed, 10*d*. Drawing. *See* Rolls Chapel Reports, 6th Report, p. 132.]

A.D. 1766, December 17.—No. 866.

LEVY, Isaac.—"New invented method for conveying of tim-"ber from beyond sea by floating machine."

Timber or wood of any kinds, shapes, or dimensions may be employed in the construction of this machine. Externally it will resemble a ship. "The construction otherwise will be "chiefly by traversly laying, and by upright and angular "ways, and position of timber or wood, fastened and held "together by iron and wooden trunnells, with or without "plank, or the bottom, sides, and waist; to have deck or decks, "or floor if convenient, with pump room, cabins, or other "proper rooms, for the use and shelter of the navigators,

"wherein also to lodge or stow the necessary provisions for "the voyage, with whatever else shall be thought proper, "material, and convenient to the safety of navigation; to be "ballasted with iron, iron ore, or other metal, ore, or stones, "and to have no vacuity or room in the said floating machine "but for the purpose aforesaid; to be provided with a rudder, "masts, yards, bowsprit, sails, anchors, and cables, and to be "rigged in a manner as shall best answer and conduce to the "facility and security of navigation."

[Printed, 4*d*. No Drawings. *See* Rolls Chapel Reports, 6th Report, p. 159.]

A.D. 1779, May 26.—No. 1225.

NARBELL, Isaac.—"A certain bitumen or fire mastic," which amongst other uses may be employed for covering "bridges, fortifications, embankments, timber piles, and "many other large erections and buildings, as well under as "above water."

The said bitumen contains yellow rosin, black rosin, white stone ground, and lime. These ingredients are well pulverized and mixt together, then melted in a ladle or iron pan till they come to a consistence fit to be used with a mop; "or the "said bitumen may be made more portable for freight and "carriage by being formed into cakes of any size by means "of being emerged, when melted as aforesaid, into common "spring, pump, or river water, which being reduced by fire "may be used for the several purposes aforesaid."

An "Egyptian mastic" is also comprised in this Specification but is not used for any purpose to which this present series of Abridgments applies.

[Printed, 4*d*. No Drawings. *See* Rolls Chapel Reports, 6th Report, p. 164.]

A.D. 1785, November 4.—No. 1504.

WATSON, Christopher.—A "floating dock for docking of "ships in rivers, harbours, or at sea, and where there is no "tide."

This dock is built of wood in the same manner as a ship, and consists of keels, keelsons, bulge ways, transomes, upper futtocks, &c. made of Riga fir; also of main wales, gunwales, gates, floors, beams, knees, riding bits, &c. The gates have scuttles in them, there is also a scuttle in counter, and blocks for the ship's keel to stand on.

"The utility of a floating dock is, to dock ships in foreign
" parts where there is no flowing of tide by pumping out the
" water to repair the bottoms of ships in a judicious way, to
" prevent the great expence of heaving down, besides the
" risque of springing their masts and straining the hulls to a
" considerable degree, and saving a great deal of time also.
" In many parts of this kingdom floating docks would be
" useful, and might be sent from port to port in case of ships
" meeting with damage, and could not be moved. Ships
" losing spring tides often in other docks may undock at all
" times of tide, and any time in the springs, by undocking in
" the deep water as soon as finished."

[Printed, 1s. 2d. Drawing.]

A.D. 1790, March 13.—No. 1734.

TATE, JAMES.—"A machine upon an improved principle for
" the purpose of raising of ballast, discharging the cargoes of
" ships, and otherwise assisting in the performance of many
" useful and laborious works."

In this invention, a "great rolling weight or wheel" is made to constantly descend an inclined plane by means of a smaller weight. "The agitable table" that forms the continued inclined plane is placed upon a universal joint, so that pressure upon its extremity bears it down upon a platform underneath.

The power said to be acquired by the above-mentioned arrangement is applied to raising ballast in cutting canals, and for other purposes. An oblong platform, in connection with rollers and chains, carries two rows of barrows with dropping bottoms. The bottoms drop at a certain place on the platform as the barrows travel along, and they are replaced a little further on.

When used to raise ballast in rivers or harbours, the said raising machine has scoops instead of barrows, and rollers are so placed on the scoops and platform, that every scoop as it comes to the bottom may have its fore part directed downwards, and kept there a sufficient time for it to fill; the discharge of the scoops is by drop bottoms.

In some cases a double platform may be used, one over the other, so as to admit of the carts or scoops being drawn between the said platforms.

[Printed, 4d. No Drawings. See Rolls Chapel Reports, 8th Report, p. 182.]

A.D. 1790, March 24.—No. 1738.

RUMSEY, JAMES.—" Methods of applying the power of water, " of air, & of steam, either seperately or together as circum- " stances may require, to the purposes of milling & giving " useful motion or effects to various kinds of machines, & for " the advantageous management of shipping, and vessells of " all descriptions used in & upon water of all kinds, in various " circumstances & situations."

A portion of this invention relates to a floating dock " for " building, repairing, or moving vessells in." This dock " is " a large flat-bottomed straight-sided scow vessell or machine, " built strong & higher sided than the draught of the water " of the vessell intended to be put into it. One end of this " machine has strong gates that open outwards, which, when " opened, lets the machine sink deep enough to slide it under " a ship which passes thro' the aforesaid gates ; when the ship " is in & shoared up, the gates are closed, & the water pumped " out of the machine or floating dock by my steam & forcing " engine, or otherwise, which will, as well as the sails of the " ship, move this floating dock in any direction, as over barrs, " up or down shallow rivers, thro' canals, or into harbors or " ports to load, whither ships could not otherwise get. They " are also excellent docks in places where there is little or no " flow of the tide ; large ships loaded may be moved in these " machines with great facility where there is but three or four " feet of water."

[Printed, 1s. 4d. Drawing. *See* Rolls Chapel Reports, 6th Report, p. 182.]

A.D. 1791, January 14.—No. 1788.

BROOKS, JOSEPH.—" A buoyant engine or machine for the " purpose of raising water, boats, and weights from a lower " to a higher level, without the aid of fire or wind, and with- " out taking any water from the uppermost level, unless in " using a greater quantity."

A pit is prepared, the top of which is higher than the place to which the boat or weight has to be raised ; a horizontal door moves up and down therein and fills the cavity thereof. Ropes, passing over pulleys, suspend the door horizontally, and the door may be raised by a capstan. Suitable valves are placed in the door. A subterraneous passage being between the

bottom of the canal and the bottom of the pit, permits water from the canal to come in beneath the door as it is raised. In some convenient part of the subterraneous passage, a groove is made, so as to admit a vertical door ascending and descending therein, and thus to turn on or off the water from the canal. The depth of the pit is so proportioned that the depth of its bottom below the level of the surface of the water in the canal may exceed the depth from the top of the said pit to the said level.

As the water from the mouth of the said pit may be conducted in any direction, this contrivance may be applied "either to fill the pen between the sluice gates of locks on "canals or navigable rivers from the water in the lower level, "whereby the loss of water from the higher level of the canal "or river, by filling the said pen when boats pass through "the same, will be avoided, or the upper level of the canal or "river may in dry seasons be supplied with water from the "lower."

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 7, p. 361.]

A.D. 1791, February 24.—No. 1793.

ASHTON, ISAAC.—"A method to sustain or resist the weight "or pressure of solids and fluids in any lateral or antivertical "direction."

The intention of this invention is to apply an arch either sideways (so as to resist the pressure of arches turned over rooms or of the earth to form wharfs, or embankments), "or "antivertically as in keels of ships, barges, and other vessels' "bottoms." "It is also applicable in foundations for walls "of every denomination where art is necessary to prevent the "superstructure from giving way, as also in a great variety "of other cases." "The peculiarity of the invention does "not consist in the arch itself, but in the providing an abut-"ment for the arch, so as to enable it to resist or sustain any "weight or pressure which may come against it. This abut-"ment is usually called the springing or skewback of the "arch."

The drawings represent the springing of the arch dovetailed into the last of the stones that form the arch; the joints of the stones that form the arch all radiate from the same centre

when they are in position. In an arch for wharfing, the joints form vertical angles in the centre of the arch, one half of the joint radiating from a centre on one side of the arch the other half of the same joint radiating from a centre on the other side of the arch. A similar plan is shown in the construction of an inverted arch. The centre, mentioned above, from which the joints radiate, is in plan (or horizontally) at some distance from the vertical plane in which the arch is built.

[Printed, 1*s*. Drawing.]

A.D. 1791, July 5.—No. 1814.

PLAYFAIR, JAMES.—A "method of constructing locks for " navigable canals on principles entirely new, and also of " improving those already erected, whereby any given portion " of the water usually employed in the ascent and descent of " vessels is saved."

The water which has served to raise or fall a boat is allowed to pass from the lock into reservoirs whose apertures of communication with the lock are upon different levels. These apertures may be opened and shut at pleasure, so that the water may pass from the lock to the reservoir, or from the reservoir to the lock in the following manner:—Instead of passing the water which fills the lock at each ascent or descent of a boat immediately into the lower part of the canal, it (the said water) is allowed to pass into the said reservoirs. Their communications with the lock being closed, they remain full until the transference of another vessel from one level to the other is required to be accomplished; then the lock is nearly filled from the reservoirs, the remainder being supplied from the higher part of the canal. Each reservoir is the same in superficies as the lock and it contains half the quantity of water used in passing one boat. The surface of the water in any one reservoir is upon the level of the bottom of the aperture of the cistern which is immediately above. According to this plan no more water is used for the deep locks than for the shallow ones. Two valves are used in connection with each cistern, so as to be pressed in their places by the action of the water, in whichever position the water may be.

[Printed, 10*d*. Drawing.]

A.D. 1792, March 29.—No. 1862.

FEUILLADE, Lewis.—"The art or method of constructing "a machine which, with the application of a very inconsider-"able proportionate power, and with great expedition, will "break and remove rocks and other impediments to naviga-"tion, raise ships and other things which are sunk, cut "canals, and also roads or ways, through high hills or moun-"tains, cleanse and deepen harbours and ports, and which "may be advantageously adapted to many other occasions "where great force is required."

"The crik or elliptick machine" is the subject of this invention; its use "is to apply a great power to the removal of "rocks or other heavy bodies from the bottom of rivers or of "the sea." This is obtained by fastening a hook or spoons to the body intended to be removed, and then moving or lifting this hook up by means of a lever, the hook being fastened to one end of the lever. The fulcrum of the said lever stands at one end of the boat or floating bed, which supports the whole machine and is prevented from sinking by two upright pieces of timber which reach from the said end of the boat to the bottom of the river. The free end of the lever is moved by a rope wound round a cylinder. The vibratory action of men upon a foot board is made to act upon certain collar levers that carry clicks and thus cause the revolution of the cylinder and actuate the lever.

Windlasses, supported by upright timbers bring up the lever "to recharge it."

The spoons above-mentioned cut and raise sand by means of chains wound round the cylinder.

[Printed, 1*s*. 2*d*. Drawing.]

A.D. 1792, June 19.—No. 1892.

WELDON, Robert.—"A machine or contrivance for convey-"ing vessels or other weights from an upper to a lower, or "lower to an upper level, on canals."

The drawing shows the said contrivance, also the inside of a lock or pound in which it is immersed.

"The machine consists of a trunk or cassoon made of copper, "iron, wood, or other materials, and of dimensions equal to "the reception of vessels or other large bodies and weights. "At each end thereof is a doorway, which the vessel, &c. are

" to be floated through, into or out of the trunk, and being " received therein, and the door then shut with a given " quantity of water to float the vessel, &c., and counterpoize " the machine, it may then be easily raised or lowered at " pleasure by means of racks and pinions, or chains and " pullies (as shall be found most convenient), from one level " to another, and the vessel, &c. be delivered accordingly." An aperture at each end of the lock, one at the upper, the other at the lower level, has a sliding gate or bolt to receive the ends of the trunk, to which it is to be closely fitted at the time the vessel, &c. is received or delivered. The said sliding gate is moved by racks or chains. To raise or lower the trunk, chains that are fixed to uprights are employed, the uprights projecting from the trunk. A shaft that works in bearings on the lock winds up the chains, or unwinds them as the case may be. When the trunk is brought to the aperture of the lock, it is confined there by means of levers. "The machine " is further regulated by means of a pump, an air pipe, and " other apparatus, to be applied as occasion may require."

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 2, p. 235.]

A.D. 1792, July 28.—No. 1905.

LONGBOTHAM, John.—A "method of supplying canals, or " any other cuts, ponds, or sluices wanting the same, with " water."

The said water is supplied from the rain which falls upon reservoirs made in "high and moorish grounds." For a given purpose, either one large reservoir may be employed, or several smaller reservoirs that communicate with one another by means of suitable pipes or passages.

To conduct the water from the said reservoir or reservoirs, two aqueducts lead from the bottom of the reservoir towards the canal to be supplied. In each aqueduct is fixed a paddle or clough which can be risen, by means of a screw, to any pre-determined height, so as to deliver a known quantity of water in a given time; for this purpose a pointer at the head of the screw moves over a graduated index.

Another method of accomplishing the said regulated supply is by means of iron pipes or cylinders at the bottom of the reservoir. To each pipe is fixed a large stop-cock, the head of which is moved by a lever or other mechanism. A graduated

dial plate shows the quantity of water discharged in a given time.

The water may be conveyed to the canal "either by open " drains, or by aqueducts, made of stone or brick and morter, " underground, from one mile to fifteen miles; from the run- " ning of the waters out of the reservoirs, for the supplying " canals," &c.

[Printed, 4d. No Drawings. *See* Repertory of Arts, vol. 4, p. 145.]

A.D. 1793, June 18.—No. 1958.

GREEN, JOSHUA.—A "method of constructing navigable " canals, without the use or necessity of locks."

This method "is by inclined planes, wheels, balance vessels, " and levers of a particular construction."

Two inclined planes reach from the lower level to the higher; one is for the ascending boats, the other for the descending boats. The inclined planes are shod with iron, so as to allow the carriages that hold the boats to move with facility. The hauling apparatus is an axis fixed at an elevation across the upper canal; this axis carries ropes, and it can be rotated by means of handspokes in a regulating wheel. The descending boat and its carriage "draws up the other, ex- " cepting the friction, which will be easily overcome" by the hauling machinery. The carriages are open at each end for the reception of the boats, and are framed together on two sides. The bottom frame of each carriage is corded with a continuous cord that proceeds from side to side through eyelet holes, and the boat rests on the said cord; the frame is mounted on wheels.

A third inclined plane assists the vessels going in and out of the upper canal. For instance, the ascending vessel, having arrived at the top of its inclined plane, is landed on to a flat and then descends the said third inclined plane into the water at the upper canal; a rope fastened to an axis regulates its descent. The carriage is heavier than water, so as to clear itself from the boat by sinking, either at the upper or lower canal.

A second method of working vessels is by means of a single inclined plane with two lever wheels and an axis, but this is not so expeditious as the method first described.

[Printed, 4d. No Drawings. *See* Repertory of Arts, vol. 5, p. 11.]

A.D. 1793, October 16.—No. 1964.

SPARROW, JOSEPH.—A "method of raising, removing, and "delivering earth or water, by which rivers, canals, or fish "ponds might be made or emptied."

A vessel or "trunk" is employed for containing the earth to be removed, and is suspended from one end of a long lever. The raising or lowering of this lever, thence the proper working of the said vessel, is accomplished by means of an ordinary windlass.

The vessel has two hinged doors at the bottom thereof; these are held in position by means of chains connected to a rope, the said rope being coiled upon a barrel mounted in the frame that hangs from the long lever. The long lever is mounted in a frame that is on wheels and that carries a circular ring of wood to act as a guide to depress the said lever.

In using this apparatus, the windlass is fixed on the opposite side of the river, canal, or fishpond to the lever and its appurtenances, and the barrel is turned so as to lower the vessel. The earth to be raised is placed in the vessel, the windlass is worked, the lever moved, and when the vessel *is in* a suitable position, the doors in its bottom are allowed to open and discharge the materials. To open the said doors, a cord pulls a catch from the teeth of a ratchet wheel on the abovementioned barrel. The doors being again closed, the same operation is repeated. For the sake of expedition, the vessel may contain two parts, one to be filling, whilst the other is raising or delivering; in this case, a small lever, on a tripod, takes the vessel to be filled off the long lever.

When it is required to empty a fishpond, a vessel to contain water, with an opening in its bottom is employed. To the bottom there is a weighted door, which can be raised when necessary, by means of a rope.

[Printed, 1*s*. Drawing. *See* Repertory of Arts, vol. 5, p. 77.]

A.D. 1794, March 18.—No. 1981.

ROWLAND, EDWARD, and PICKERING, EXUPERIUS.—"An "improved method of constructing navigable canals, without "the use of locks or inclined planes, and whereby most of "the objections to and inconveniences arising from canals "are effectually removed."

This invention relates to raising a boat from a lower canal to an upper one, or lowering the same from an upper canal. A well, placed between the upper and lower canal, contains a driving chest. The top of the well is below the plane of the bottom of the lower canal. The diving chest is in the form of a boat closed at the top; pillars and a cradle, at the top of the diving chest, are of such a weight as to balance it exactly in the water of the well. The cradle of the shape of a boat, and of a size to admit within it the boat to be raised or lowered, has a slide at each end. At the end of each canal, doors are fitted; these correspond with the slides of the cradle. The doors and slides, each to each, are fitted together exactly with leathered joints, and, during the transference of the boat to the cradle, they are bolted together, so that no water may be lost. The doors and slides then being shut, and the bolts withdrawn, "the cradle is prepared for ascending or " descending, according to its respective situation. It may " be worked by a rack and pinions, or with a capstan with " ropes, &c. &c. A frame must be made from the bottom " of the well to the height of the upper canal on both sides " the machinery, for the whole to slide up and down in with " freedom and exactness, and with rollers at the sides and " ends of the cradle and diving chest, to prevent any great " degree of friction."

Instead of using the diving chest and pillars, the whole may be balanced by weight alone.

[Printed, 4*d*. No Drawings. *See* Repertory of Arts, vol. 1, p. 81.]

A.D. 1794, May 8.—No. 1988.

FULTON, Robert.—"A machine or engine for conveying " boats and vessels and their cargoes to and from the different " levels in and upon canals, without the assistance of locks " or the other means now known and used for that purpose."

According to one plan, a double inclined plane is extended from one level of the canal to the other, one ascending inclined plane, the other descending. The boats are conveyed from one level to the other by means of cisterns that traverse the inclined planes. These cisterns are supported on wheels and connected to ropes that pass over fixed pulleys. The upper cistern being made fast, each cistern is loaded with its boat

from its respective level. If the weight be insufficient to raise the lower boat, water is let into the upper cistern.

In a vertical lift, a shaft is sunk, of sufficient size to allow the above-mentioned cisterns, together with their respective boats, to work up and down easily. The drawings show a tunnel at the bottom of the shaft. In this case the cisterns are without wheels, and, at each level, inclined planes, in connection with the shaft, raise the boats on to the cisterns. The operation of this lift is similar to that of the above-described inclined planes.

In either of these arrangements for conveying boats and their cargoes to and from the different levels in and upon canals, the power employed to raise the boats on the cisterns may be obtained by a capstan or water wheel.

[Printed, 10*d*. Drawing. *See* Repertory of Arts, vol. 7, p. 222.]

A.D. 1794, July 29.—No. 2004.

SLADEN, WILLIAM.—"Machinery for the removing and con-"veying of earth, stones, mud, sand, ballast, or any other "articles, materials or things on level ground, and for emp-"tying and conveying the same from or out of canals, rivers, "ponds, foundations of houses, cellars, pits, or holes, and "also for lowering and conveying the same from eminences "and heights, and which is applicable to various other "purposes."

This machine may be worked either upon a level, or upon an ascent, or vertically. It consists of a frame, divided longitudinally or vertically, as the case may be, into two portions, within each of which buckets sustained by a carriage can be moved up or down. The carriages are connected by ropes or chains that pass over pulleys at the extremities of the machine; one set of pulleys are worked by a winch handle in connection with cog wheels, and whilst one carriage is moving upwards the other moves downwards.

Intermediate rollers keep the ropes in their places. The buckets are made so that they can be tilted by the person at the winch. Catches are applied to prevent the main wheel from running back.

This apparatus is intended to be worked by two or more men, but it may be modified, so as to work by horse power or otherwise.

[Printed, 6*d*. Drawing. *See* Rolls Chapel Reports, 6th Report, p. 146.]

A.D. 1794, November 11.—No. 2021.

PRICE, JOHN.—" A method or contrivance to save a large " portion of the water at locks upon navigable canals."

" The lock being made of any given size and dimensions, " whereof the superficial measure is known to fall six feet and " six inches, in order to save five feet of water, let five reser- " voirs, or side ponds " be made, " each pond being double " the superficial measure of the surface of the water in the " lock."

In passing a boat through the lock from the upper to the lower level of the canal, the boat having been floated into the lock and the gates shut, a communication is made between the upper portion of the lock and the upper side pond, thereby allowing a quantity of water to flow into the pond and reducing the height of that in the lock in a proportionate manner. The lock is consecutively brought into communication with the reservoirs as the boat descends, and the small quantity of water which remains to be discharged from the lock is allowed to escape to the level of the lower canal; the boat is then floated from the lock.

The drawings show a lock with five side ponds, all on one side of the canal, but they may be on either or both sides, according to convenience. " All the water within two feet " may be saved, whether the lock be six, eight, ten, or twelve " feet fall, observing to have a side pond for each foot to be " saved." A culvert through the bottom of the side wall near the middle of the lock, conveys the water to or from the said ponds; " such culvert to be carried in a straight line to " a convenient distance for communication to the different " side ponds." Then a well to be continued vertically " from " such culvert to a proper height to communicate with the " side ponds, and in the side walls of such well are to be fixed " proper valves with communications to the respective side " ponds."

[Printed, 10*d*. Drawing.]

A.D. 1795, August 24.—No. 2060.

HECKFORD, NATHANIEL.—" Machinery, for the purpose of " raising and removing of earth, sand, gravel, clay, stones, " or any other thing, from the bottom of canals, or other

" places of any depth, to the surface of the earth, or higher if " required."

A long lever is pivoted on the top of an upright shaft; it is thereby capable of up or down motion in a vertical plane as well as of horizontal movement in the arc of a circle. One end of the lever being lowered, the weight is attached to it and is raised by means of a rope that winds on a roller. An iron arc is fixed to the shorter arm of the lever; this arc has " a groove upon its outer side for the reception of a chain, " which works in it like a rope in the wheel of a steeple bell, " and is connected with the roller and cogged wheels, by " which the whole is ultimately moved." A wooden frame, near the bottom of the shaft, holds the roller and raising gear, one of the wheels of which rolls upon a circular iron track round the bottom of the upright; this arrangement enables the wooden frame to move round in accordance with the horizontal movement of the lever, to which it (the frame) imparts motion. "Thus a weight, when raised to the necessary height, " may, by the horizontal movement which is then to be re- " sorted to, be placed upon the bank of the canal or wall with " the greatest possible facility, and the machine may be " worked either on the surface or at any moderate depth, " according to the length and proportions of the upright and " the lever."

[Printed, 8*d*. Drawing.]

A.D. 1796, May 31.—No. 2115.

HASKEW, Edward.—"Machinery, for the purpose of raising " and removing of earth, sand, gravel, clay, stones, or any " other thing from the bottom of canals or other places of " any depth, to the surface of the earth, or higher if " required."

A screw wheel on a vertical axis is put in motion by a horizontal screw that is worked by two handles. Friction rollers support the wheel, and the framework carrying the wheel, &c. runs on four small rollers, so that the machine is easily moved from place to place by means of a rope and pulley. Properly braced arms diverge from the said vertical axis, and a barrow being suspended at the end of each arm, it may be, upon the slope of the canal, conveyed from the bottom of the said canal to the top by one revolution of the wheel round its axis; "and

" when the machine stands upon a level and the wheel is " worked horizontally, it is so contrived as to raise perpen- " dicular weights in the manner of a crane, or to wind carts " or barrows up an inclined plane in or on the side of a canal; " this is done by means of a groove running round the frame " of perpendicular joists and braces between the arms or " levers and the large wheel, and parralel to both, in which " groove runs a rope with a barrow or bucket at each end, " drawn up and let down alternately according to the direction " in which the large wheel is turned."

[Printed, 10d. Drawing. *See* Rolls Chapel Reports, 6th Report, p. 191.]

A.D. 1796, July 4.—No. 2126.

LUKE, JOHN.—" Machinery for the purpose of lifting, draw- " ing, and conveying of loaded and light vessels from one " canal or branch of canal to another, on a slope or plane " surface in lieu of stone or other locks."

The description of this invention is comprised in notes and references upon the sheet of drawings.

From the upper canal to the lower there reaches an inclined plane, and a water wheel is placed nearly on a level with the upper canal. By means of gearing, pulleys, and ropes, a carriage containing the boat is drawn up the incline, the gearing being driven by the water wheel when there is sufficient water for the purpose, otherwise winches or levers are employed. A truck upon wheels, is connected to the said carriage by ropes that pass over pulleys; this truck or "tun" is loaded with stones and water, and serves partly as a counterbalance weight and partly as a regulator during the ascent and descent of the boats. When the boat is drawn up, the tun descends, and when the boat descends the tun ascends. The carriage being drawn up the principal inclined plane is then allowed to descend another and shorter slope, which leads it into the water of the upper canal. An "ancient river" is supposed to furnish a supply of water.

[Printed, 1s. Drawing.]

A.D. 1797, February 7.—No. 2165.

NASH, JOHN.—" A new and peculiar art or method of con- " structing bridges of plate iron, either wrought, cast, frame, " or put together so as to form hollow bodies, masses, or

" cubes, capable of being filled up with earth, sand, stone, " gravel, or other materials to make the same solid bodies, " masses, or cubes, or not being filled have the semblance of " solid bodies, masses, or cubes."

The said " hollow bodies, masses, or cubes," are shown in the drawings as " hollow frames or boxes, each box consisting " of four sides and a bottom." " These boxes are afterwards " filled with earth, clay, or sand, or gravel, or gravel mixed " with lime, or sand mixed with lime, or rough stone, or " rough stone masonry or bricks, or freestone, or any " other substance;" they " may be of cast iron or wrought " iron, may be cast, rolled or hammered in flat plates and " frames, and put together." They may be cast without bottoms and the bottoms put in, or they may be cast with bottoms, or they may be used without bottoms or filling up, and be boarded or plated over at the top.

In one instance that is shown in the drawings a dam for a pier is "formed hollow by piles of plate iron grooved, rebated, " and dovetailed into each other, which, when fixed into each " other, form a hollow box, and when driven or inserted " into the bed of the river form a dam for the pier," " and " when the pier is built are driven home into the bed of " the river, make a box of dovetailed piles enclosing the " ground on which the pier stands, and securing it from being " undermined by the water passing through the arch."

[Printed, 1*s*. 8*d*. Drawings. *See* Repertory of Arts, vol. 6, p. 361.]

A.D. 1798, February 1.—No. 2213.

CLAY, Henry.—" A certain method of saving part of the " water now lost in passing of boats and barges through " locks on navigable canals."

The following is the description of this invention :—

"Build two locks opposite or by the side of each other, " with one or more culvers, trunks, pipes, troughs, or other " tubes that will convey or let the water pass through from " one of the said locks to the other lock with a party paddle, " poundes, or paddles or other ways that will let go or stop " the water occasionally; let a boat or barge be passed on " one of the said locks full of water from the upper pound; " let also a boat or barge be passed from the lower pound " into the other lock which is empty; then let go or draw " the party paddle or paddles, or other ways, and as the upper

" boat or barge falls downwards, the same water that passes " or runs out from the full lock will occasion the lower boat " or barge to rise upwards until they both are on the same " level. Then shut, drop down, or stop the party paddle or " paddles, or other ways, and let go the descending boat or " barge to the lower level; at same time let water into the " lock with the ascending boat or barge to raise it to the top " or upper level. Use the same method for saving part of the " water if only one boat or barge is passing at the same time."

[Printed, 4*d*. No Drawings. *See* Rolls Chapel Reports, 6th Report, p. 146.]

A.D. 1798, March 10.—No. 2220.

GOOLDING, HENRY.—A "machine, instrument, or engine " for raising, removing, and carrying of earth, stones, rubbish, " or anything of the like nature, so as greatly to facilitate " and render less laborious and expensive the carrying on and " executing the works of canals, navigable cuts, or any other " great and important work where the same may be required " to be removed and carried away."

Notes and references upon the sheet of drawings furnish the description of this invention.

Frames support inclined planes on which wheeled baskets are arranged to travel; the baskets hang on to the wheel frames. The ends of the inclined plane may be lowered to receive the loaded baskets, and are raised again by a pulley working in conjunction with a capstan or winch. A loaded basket being connected to one of the travelling wheels, and the longitudinal beam that carries the said wheel being raised, the basket travels along the beam by means of a horizontal wheel and hauling rope. The box is made to discharge its contents over any desired spot, by stopping it accordingly and withdrawing a pin.

In a machine especially applicable to depositing material in boats, the carriages are suspended by means of ropes and blocks and are thus able to be raised and lowered at pleasure.

A third modification is adapted to "raising and removing " of earth from deep cutting in navigations." A crane is employed to transfer the loaded baskets from the carriages on the longitudinal beams to frames on other beams placed at right angles therewith.

[Printed, 2*s*. 2*d*. Drawing.]

A.D. 1798, August 3.—No. 2255.

CHELL, Philip, and NICKHOLLS, Henry.—" A machine " for lifting, raising, and conveying boats, vessells, and other " things from an upper to a lower level, and from a lower to " an upper level, on canals and rivers to save water, and pre- " vent tunnelling."

A cradle is placed in an erection similar to a common lock. The cradle is large enough to admit a boat or barge, and has " stop gates " at each end. The upper end of the canal and the bottom end of the lock also have stop gates. The boat sails into the cradle from the upper or lower canal, as the case may be, the stop gates of the lock and of the cradle respectively are closed, and the cradle with its contents is lowered or raised; a water-tight joint is then made between the canal and the cradle, and the boat sails out upon the lower or higher level. The cradle is moved up or down by means of racks and pinions, and counterbalance weights, in connection with ropes that pass over pulleys, assist in the said moving. Large pulleys have their bearings in an elevated framing that reaches across the lock, and a slide the length and breadth of the lock may be drawn forward by horizontal screws and thus raise the cradle, the said slide resting upon the pulleys and being connected to the cradle. Valves in the bottom of the cradle admit water, and thus assist it in sinking. The said counterbalance weights are casks with false bottoms and valves (to admit more or less water) in their real bottoms. To prevent tunnelling an inclined plane is used. A small side pond catches the leakage from the stop gates to supply the casks with water, and the water is drawn off from the bottom of the wells belonging to the counterbalance weights by means of a level in connection with the lower canal.

[Printed, 4*d*. No Drawings. *See* Rolls Chapel Reports, 6th Report, p. 194.]

A.D. 1798, December 24.—No. 2284.

FUSSELL, James.—" A machine or balance lock for raising " boats from a lower level of a canal to an upper, or lowering " the same from an upper to a lower level of a canal."

The method of this invention is " by a perpendicular lift, " by balance lock, or machine with wheels, chains, balances, " screws, vessels, or receptacles, levers, shafts, and rack- " wheels of a particular construction."

The lock is divided by a midway partition wall into "lock "pits." The receptacles that convey the boats up or down (each in its own lock pit) are made of wood or iron, and they counterbalance each other. Two chains pass over certain upper pulleys, which have their bearings fixed to the lock and under other pulleys that are attached to the receptacles; the ends of the said chains are fastened at the top of each lock pit. The flowing of the water into the bottom portion of the upper receptacle puts the receptacles out of balance, and depresses the upper receptacle while the lower one is raised. The upper and lower canals are divided into two mouths or apertures, "each to fit the ends of the receptacles, to make "the mouths of the canal and that of the receptacles water-"tight." The motion of the receptacles is regulated by toothed gearing, the shaft of which carries a fly and brake wheel.

If the hill should be of very hard rock an inclined plane may be adopted. Two railways are placed side by side from the upper to the lower level, and having a space between them in which is placed the shaft that carries the pulley (inclined in this instance) over which the before-mentioned chain passes. The receptacles are preserved in a horizontal position.

[Printed, 4*d*. No Drawings. *See* Repertory of Arts, vol. 11, p. 7.]

A.D. 1799, June 26.—No. 2323.

HOOPER, STEPHEN.—"A machine for the purpose of cleansing "rivers, creeks, harbours, or bars of harbours and sand "banks, or other shoals at sea, by the power of the tide or "current."

A frame carries pivoted shutters, which can be placed at any required angle by pulling a cord; "the boards or shutters "are to be so close to each other that the edges may nearly "meet when standing flatways." By fixing the boards at a suitable angle, the frame is forced to one side of the river, it being acted on by the tide; the angle of the boards is then reversed, and the frame is thereby driven to the opposite side of the river. Pikes fixed to the bottom of the frame plough up the ground, and the earth is forced away with the current of water. The aforesaid shutters open and shut like Venetian blinds.

Another frame, also mounted with pikes, is shown in connection with bridles or chains fastened to ropes; this frame or sluice is "made by boards, or any close body."

A sluice made by canvas fastened to yards, separated by two sprits, is also shown together with bridles and ropes.

These sluices may be applied to the widening of rivers, by means of ploughs, rakes, &c., "to turn the ground from the "side into the bed of the river, by making a rope fast to the "bridles of the sluice," the other end to be fastened to the "plow, rake, &c. to work by; then close the boards or "shutters on the angle to keep the sluice in the stream, which "will give power to carry forward the works." A rope, shown in connection with the frame first described, "to which "the bridles are fixed, may be made fast on board a lighter "or vessel riding at an anchor for that purpose, and to be "veered away occasionally."

[Printed, 6*d*. Drawing.]

A.D. 1800, August 2.—No. 2434.

REDDELL, Isaac Hadley.—A "method of constructing car- "riages for the conveyance of merchandize, either by land or "water, which carriages may be removed (either loaded or "unloaded) from the land to the water, or from the water to "the land, with ease, expedition, and safety."

The said carriages are made with wheels but water-tight, and, when they are in the water, a considerable number of the small sized carriages may be fastened together and hauled by one horse; "if they are wanted out of the water they must be "separated, and drawn up an inclined plane by one or more "at a time."

In canals where the water is on different levels, three of these "boat carriages" fastened together, may be passed from one level to another by means of an inclined plane or inclined planes "to go down into the water at the head of the "upper level, and another from thence down into the water "of the lower level, and of course a certain degree of power "would likewise be necessary to let down and draw up the "carriages on the inclined plane." For this purpose a steam engine may be used.

When two of these "boat carriages" are fastened together, "they may pass the locks together as one boat, if there are

" any locks on the line of the canal where these boat carriages " may be used, or pass the planes separately with expedition " and safety."

[Printed, 4*d*. No Drawings. *See* Repertory of Arts, vol. 14. p. 309.]

A.D. 1800, December 4.—No. 2453.

HOOPER, STEPHEN.—"A new method, by means of certain " machinery, of cleansing and deepening dry harbours, rivers, " creeks, &c., part of which machinery may be applied to " other useful purposes."

A barge is anchored across the tide, and a "plowshare," fastened to the end of a staff, is guided from the barge. A sail has its lower part kept within six inches of the ground by two sprits, its upper part being fastened to the side of the barge; this sail being thus mounted, and "being held against the " tide abreast of the plow " quickens the tide to drive away " the soil as it is plowed or raked up."

One method of stopping the water until it has got sufficient head to drive away the mud, is by means of "a moveable " backwater" of ports and rails framed together. These frames, disposed in the shape of an arch, are covered with canvas; when the canvas is removed, in a suitable place in the said frames, the tide can drive away the mud at that place. Posts may be disposed across the river, and they are then held up against the tide by anchors."

A water wheel is described and shown which may be worked in a vessel with two bottoms. The mud or soil is drawn to the sluice of the water wheel by means of two drags which are actuated by ropes made fast to a roller, the roller being rotated by gearing in connection with the water wheel.

A funnel may be used "to convey the water from a sluice " to any distance, to plough up and drive away mud."

[Printed, 8*d*. Drawing.]

A.D. 1800, December 30.—No. 2462.

HUDLESTON, LAWSON.—"A method of conveying boats or " barges from a higher level to a lower, and vice versâ, on " canals, by the immersion of a plunger or plungers."

This invention consists in the application of the two following laws of hydrostatics to the above-mentioned purposes:—

—1st. "That two columns of water, however different in "lateral dimensions, will, if there be a communication be- "tween them, always maintain one and the same level." 2nd. "That the immersion of any solid body in water will "displace a portion of the fluid equal in quantity to the bulk "or solid contents of the body immersed."

Near to the lock is a reservoir, the top of which is level with the top of the lock, and a communication is formed between the lower part of the lock and that of the reservoir. To raise a boat from the lower to the upper level of the canal, the boat is floated into the lock, the lock gates closed, and the said plunger or plungers allowed or compelled to descend; a quantity of water is thereby forced from the reservoir into the lock, thus filling the latter and raising the boat therein, whence it is floated into the higher level of the canal. Aboat entering the full lock is lowered by closing the gates and raising the plunger or plungers; the water then descends and with it the boat.

The plunger may be oblong and rectangular, and may be raised and depressed by a windlass; it is counterbalanced by a weight suspended by a chain to the extremity of a curved lever. The counterbalance weight is removed from the axis of the lever during the rising of the plunger, and approaches the axis during the descent of the plunger into the water.

[Printed, 4*d*. No Drawings. *See* Repertory of Arts, vol. 15, p. 81; and Rolls Chapel Reports, 6th Report, p. 149.]

A.D. 1801, November 10.—No. 2554.

HOOPER, STEPHEN.—"Machines or machinery for the pur- "pose of cleansing harbours, creeks, rivers, grain, etc[a]."

"A machine for driving or scowering away banks or sholes "in rivers" by means of the current or tide, or rise and fall "of the water."—The drawing shows a barge riding at anchor, and a water wheel fixed in a frame and secured to one side of the barge. A prop or pole in connection with the barge also confines the frame up against the tide. The power of the water wheel is communicated by means of a shaft, universal joint, and bevil gearing to a wheel working in a well in the boat. The latter wheel raises the water into a reservoir from whence it is conveyed into a tunnel at the side of the vessel. The end of the tunnel is pointed to the parts to be

removed, and the force of the water coming therefrom drives them away. The former wheel may be mounted with ploughs, and if driven by the stream may be used "in cutting up "banks, etc[a]."

A "worm or screw to force or draw the mud or soil from "the banks, or level the beds of rivers, etc[a]."—This is mounted on a horizontal shaft, and is put into action by a tide wheel working at the side of a barge; universal joints communicate the power to the worm.

A number of lighters sunk lengthwise, and reaching from side to side of the reservoir form "a back water." The space between the vessels is filled up by frames covered with canvas, as in No. 2453.

Detailed descriptions of the water wheels, and of a machine for cleansing the smut from wheat are given in this Specification.

[Printed, 6*d*. Drawing.]

A.D. 1802, December 21.—No. 2672.

SCOTT, John; CLARKSON, James; TATHAM, William; and MELLISH, Samuel.—"Tatham's clumps," for the purpose of constructing, amongst other things, tunnels, wells, conduits, and reservoirs, also "reversed arches for the floors "of pound locks, waterways, &c."

This invention consists "in so forming, shaping, moulding, "modelling, hewing, or cutting the material intending to be "formed in Tatham's clumps, to be used in constructing the "building, utensil, or apparatus designed, that the sides or "edges thereof, when made and compleated, shall join and fit "to each other on an exact radius of a circle, terminating of "its centre so that when all the said parts are put together, "with or without mortar or cement, the said several clumps "will form a direct circle, bearing pressure inwards on the "principal of an arch, and that when the several layers, "courses, or distinct circles thereof shall be fitted and "adjusted in their proper places, such will form what is "termed a broken joint in the wall or shell, so that the same "will alternately clamp or join the courses next adjacent to "them together, to prevent their removal sideways; and "further that being fitted into each other on their flat sides, "alternate, male and female" "by means of the shoulderings

" or wedgewise securings and abutments," "the same will " bear and resist a pressure outwards from any application " of a reasonable force."

The following are the materials of which the said clumps may be made:—" Earth, stone, clay, plaster, cements, com- " position, kiln-burnt material," and masonry.

[Printed, 8d. Drawing. *See* Repertory of Arts, vol. 2 (*second series*), p. 333.]

A.D. 1803, January 29.—No. 2676.

MATCHAM, George.—" Raising great weights, in preventing " ships from sinking, in raising ships when sunk, in rendering " ships which are disproportioned to shallow waters capable " of entering rivers, of passing bars or shoals, or otherwise " moving in shoal water, in working pumps of great power, " in supplying the place of locks on canals, and in various " other operations in which a powerful engine for sustaining " heavy burdens or raising great bodies in water may be " necessary."

"The mode I propose of raising great weights (for instance, " what I had primarily in view, a barge from a lower to an " upper canal) is by inflating a leather balloon, attached by " cordage to a wooden case, in which is a weight prepon- " derating the barge to be drawn up. At the end of the " upper canal, adjoining to the inclined plane or precipice " where the barge is to be drawn up, a reservoir of water is " to be formed, the depth of the inclined plane or precipice, " in which is suspended, by inflation, a balloon, with the " attached weights. A rope leads from it over a roller, and " is locked to the boat in the lower canal; the mouth of the " neck of the balloon being opened, the water pressing round " it expels the air, and the balloon sinks in water; when it is " at the bottom the barge will, by the rope, be drawn up " into the upper canal. When again required to work, the " balloon must be inflated through the leather pipe or neck, " which is of the length of the depth of the reservoir. The " inflation, is effected by a bellows, worked by a horse or " lever."

"The same application will effect the different purposes " specified in the Patent."

[Printed, 4d. No Drawings.]

A.D. 1803, February 3.—No. 2679.

HOOPER, Stephen.—Machinery "for the purpose of cleansing "dry and other harbours, rivers, creeks, bars of harbours, "and preventing bars from making, reducing banks or shoals, "opening a channel through sands at sea, or clearing away "the sand or beach to get off ships grounded by accident or "stress of weather on sands, and for other purposes."

An arrangement to scour each part of a harbour along the head in succession.—A reservoir is erected in a concave form with a pier head that is washed by the waves of the sea. The water, beating against the pier head, opens the valves or flaps of the reservoir, and the reservoir is thus filled to a considerably higher level than that of the water in the harbour. A tube conveys the water to the upper part of the harbour, and sluices are successively opened, so as to drive the soil into the water.

"A machine for pecking up rocks under water" consists of peckers fixed at the end of iron bars which are of sufficient length to reach the rocks the vessel is riding over. These bars have catches and other appurtenances, and may be worked by the rolling of the vessel, or a roller (working into the catches) may be rotated by hand or other power.

A lighter with a middle well and with valves, may collect water by the motion of the sea, and discharge it through a tunnel on to the place to be scoured.

A water wheel is fastened near the bottom of the water, and is driven by a shaft having a universal joint, from a vessel above. A short tunnel from the water wheel points down, so that the force of the water scours away the ground. This plan may be used for getting ships off the sand, &c.

A windmill, a shifting keel, and water wheels for obtaining motive power and for raising water are also set forth.

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 4 (*second series*), p. 161.]

A.D. 1803, August 6.—No. 2732.

LOGAN, Michael.—A "conservative lock for continuing "inland and canal navigation with a given quantity of "water."

The principles involved in this invention are:—1st. "That "a light body will put a heavy body, laid upon a horizontal

"plane, in motion when connected by a line over a pully." 2nd. An increasing resistance is equipoised by an equally increasing power, in hydrostatics. 3rd. Equilibrium between two fluid bodies being produced by a uniformly accelerated motion, any force, superior to their inertia, applied to one or the other, will make them alternately power or resistance.

A recess, able to contain the whole quantity of water wanted for the lock, is constructed parallel to the course of the canal and under the bed of the upper level. A passage between the lock and the recess is made under the platform of the upper gates; through this passage "the flux and reflux of the whole "body of water wanted for the use of the navigation at each "lock are alternately continued and preserved in the opera-"tions of the locks." Galleries parallel to each side of the lock contain jointly the whole quantity of water *for working* the lock. A pit at the extremity of each gallery "receives "and delivers alternately the whole quantity of water from "and to the gallery upon the flux and reflux of the lock." The recess has a great gate moveable upon rollers and connected to a tightly fitting plunger in the pit by means of chains that pass over a pulley.

The weight of the plungers is in equilibrium with the "relative weight and friction of the great gate" "with the "lock water at its lowest level." The weight of the water from the galleries is as the lateral pressure, at any assigned altitude, upon the great gate. The lateral pressure upon the said gate is as the depth of its centre of pressure "from the "surface multiplied into the area of the gate itself."

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 5 (*second series*), p. 333; and Rolls Chapel Reports, 6th Report, p. 152.]

A.D. 1805, January 16.—No. 2807.

SHORTER, Edward. — Mechanical apparatus for raising ballast which may also be applied to other purposes.

At the stern of the vessel is fixed "an arbor or axis nearly "parallel to the horizon in a fore and aft direction, so that "one of its extremities may be within board and the other "extremity shall be either without board or so placed as to "admit of the fixing of the external apparatus, consisting "of a fly." The said fly "is exposed to the action of any "stream of water in which the said vessel may be fixed,

" stationed, or secured, or otherwise to the action of the wind, " or otherwise to the reaction of the water through which " the said vessel may at any time be in motion, in order that " the said shaft may operate as the first mover upon other " machinery."

The fly may be constructed after the manner of the sails of a windmill or smoke jack.

The drawing shows the said shaft, the parts of which are connected, where necessary, by coupling boxes. Bevil wheel gear connects this central and main shaft to shafts at right angles to it, thence to winding barrels, one to each transverse shaft. The chains from the winding barrels pass over crane heads by which the ballast is raised as usual. Each barrel is connected with its shaft by a universal joint. A lever for throwing toothed wheels out of gear is shown in the drawings; this lever carries the bearings of one of the toothed wheels.

[Printed, 6*d*. Drawing. *See* Rolls Chapel Reports, 6th Report, p. 153.]

A.D. 1806, February 20.—No. 2912.

WOODHOUSE, John.—"Improvements relative to canals."

The only portions of this invention that pertain to the present series of Abridgments are:—

A "method of conveying boats, barges, or other vessels " from one level of a canal to another without the use of " locks."

"The application of a signal or telegraph to enable the " lock keepers to inform each other when any boat, barge, " or other vessel is approaching the locks, whereby very con- " siderable quantities of water may be saved."

In the method of conveying vessels from one level of a canal to another, the upper and lower levels of the canal are brought to a distance from each other rather more than the length of the vessel to be conveyed. Each of the levels terminate in two canals. The space between the two levels is divided into two spaces by a wall, which is carried up with the ends and side walls a sufficient height above the top level to fix the machinery upon. In each of these spaces is a water-tight vessel or "conductor," and one conductor is so suspended over its compartment as to counterbalance the other conductor; when a boat is ascending in one conductor, another is descend-

ing in the other conductor. The boat enters the conductor by means of a stop gate; the upper and lower canals also each have stop gates.

The telegraph apparatus is a tall vertical piece of timber with a board framed into the upper end of it. The board can turn round in the frame, and when the first lock-keeper has a boat in view upon the canal, he turns the flat side of the board towards the next lock and thus telegraphs its approach.

[Printed, 4d. No Drawings. *See* Repertory of Arts, vol. 8 (*second series*), p. 406.]

A.D. 1806, May 3.—No. 2933.

HOOPER, Stephen.—"An aqueduct, tunnel, or machine for "cleansing docks and other basons of penned water;" also improvements upon machinery "for cleansing dry and other "harbours, rivers, creeks, bars of harbours, and various other "useful purposes."

The following points in this Specification can be treated of in this volume:—

The said "aqueduct" is movable and consists of a jointed pipe which works by suction. When in use, one end of the pipe is applied to a hole in the sluice gate "or place out of "which mud or other impurities are required to be drawn;" the other end is formed of very short jointed pieces, or it may be a flexible pipe supported within by rings.

"An improvement upon the tunnel" [funnel?] "for receiv-"ing water from a sluice to scour away mud or soil," as described in No. 2453.—The use of interior rings permits the pipe to be bent in any direction, and prevents it from collapsing.

An improvement on the back-water sluice for cleansing harbours by the waves or swell of the sea which is described in No. 2679.—This consists of a triangular or other shaped portable vessel, framed together, and with valves opening inwards, to be fixed in any required situation by means of anchors, or other suitable methods. The cleansing is accomplished by means of a jointed pipe constructed as described above.

An improvement upon the method described in No. 2679 for scouring away loose soil in order to remove ships which may be aground, and for other purposes.—A cylinder, containing

rotating vanes, is placed under water and forces water through a jointed pipe against the obstruction. Wheelwork on board the vessel and an endless chain, are used to drive the axis of the vanes.

[Printed, 6d. Drawing.]

A.D. 1808, March 3.—No. 3112.

WILLCOX, Richard.—Machinery "whereby all objects in the " sea or clear water can be discovered from the surface " thereof with accuracy; and for raising, suspending, and " towing into harbour ships of war, and every other descrip- " tion of vessels that are or may be sunk at sea, or near the " sea coasts, channels, harbours, roadsteads, or other places, " and removing sunken rocks or other obstructions in rivers, " harbours, and channels."

[No Specification enrolled.]

A.D. 1809, April 29.—No. 3231.

TREVITHICK, Richard, and DICKINSON, Robert.— " Improvements calculated to improve naval architecture and " navigation, and to contribute to the comfort and better " subsistence of mariners, and applicable to other purposes."

One of these improvements is a movable caisson or floating dock, made of wrought iron plates rivetted together; its internal figure resembles that of a boat, it has a flange for the workmen to stand upon, and an air chamber surrounds its external surface. The vertical section of the air chamber at any part is a semicircle. The caisson is taken to the ship to be docked, a valve in its bottom is opened, and it is sunk until the upper part is even with the surface of the water. A small quantity of air is then discharged, just sufficient to sink the caisson, and it (the caisson) is then drawn under the ships' bottom. The caisson is raised to the surface of the water by ropes from the ship and the water is pumped out, thus raising the ship, which may be supported by shores and carried into shallow water.

"The sixth of our said inventions or improvements is, " buoys made of cast iron or of wrought iron plates, screwed, " brazed, soldered, or rivetted together, so as to form a hollow " water-tight vessel of any shape or size that may be requisite.

" The advantage of these buoys is, that they cannot be " injured by worms or imbibe water to make them lose any " of their buoyancy, and consequently that they will at all " times float higher and be better seen than buoys made of " wood."

[Printed, 4*d*. No Drawings. *See* Rolls Chapel Reports, 7th Report, p. 204.]

A.D. 1810, April 6.—No. 3324.

WOODHOUSE, JOHN.—"Improvements relative to canals."

1st. A method of conveying boats from one level of a canal to another, "without the use of locks." In a space enclosed between walls, a vessel or "conductor" is arranged, so as to be capable of working up and down between the upper and lower levels of the canal. The conductor is connected to counterbalance weights, by means of chains that pass over pulleys, and, at each end, it has a stop gate; at the end of each level is a similar stop gate. The boat to be raised from the lower level to the upper is floated into the conductor, the gates of the canal and of the conductor being open. The gates are then shut and the conductor is raised by means of gearing that overcomes the inertia of the chains. On arriving at the upper level, the gates of the conductor and of the canal are respectively opened, and the vessel is floated out of the conductor. By a similar process, a boat may be lowered from the upper to the lower level of the canal.

In the case of a river in which the water rises and falls, the conductor is sunk into the river until it is low enough for the boat to float over the end. Instead of counterbalance weights, certain balance vessels are used in this case; these vessels may be emptied of water, by a valve, when it is desired to sink the conductor. When the vessels are filled with water, they raise the conduct and its contents.

2nd. An improved crane to be used upon canals.

[Printed, 4*d*. No Drawings. *See* Rolls Chapel Reports, 7th Report, p. 206.]

A.D. 1810, September 7.—No. 3376.

MATHEWS, DAVID.—" An improved method of constructing " and building locks with an inverted groin or gothic conic " arch; also an improved form of the gates, and an improved " method of opening and shutting the same."

Instead of being square or oblong, the form of each of the lock gates is such that the depths of the gates increase from the hanging post to the meeting post; the lower edge is a straight line or a curve descending from the lower end of the hanging post to the lower end of the meeting post. The gates shut against a sill in the form of the lower edge of the gates. The lower edges of the gates, instead of running on a platform as usually constructed, move a little above a surface of brick or stone, "which, in form, has the figure which is swept out "by the lower edges of the gates in opening, but is placed a "little below them." In turning, the gate runs upon a circular rib, by means of a roller; a pinion and segmental rack communicate motion to each gate by means of a capstan. The said rib is placed under the centre of gravity of the gate, and the centre of the rack is also the centre of the gate's motion; one end of the rack is fastened to the back of the gate at its centre of pressure, the other end runs into the wall by means of a circular culvert. Instead of a rack and pinion, a chain passed round a roller, in connection with an iron segment, may be used.

This lock is said to be more economical than the usual one and the pressure against the gate and side walls is less than in locks with gates of rectangular section.

[Printed, 10*d.* Drawing. *See* Repertory of Arts, vol. 18 (*second series*), p. 140; also Rolls Chapel Reports, 7th Report, p. 209.]

A.D. 1811, March 4.—No. 3405.

GUPPY, SARAH.—"A new mode of constructing and erecting "bridges and railroads without arches or sterlings, whereby "tho danger of their being washed away by floods is "avoided."

On each side of the river over which a bridge or road is to be constructed, the inventor drives a row of piles connected together by suitable framing, and behind these she drives and connects other piles and framing. Upon the banks of the river the inventor builds "certain masses of connected "masonry or other ponderous structures, with piles or with- "out, in order and to the end that the said piles or masonry, "or other structures, shall be capable of sustaining and "permanently resisting the action of a considerable force "applied or exerted in directions tending to bring the same

"together; and I pass across the said river or place, from "the upper or other convenient part of the said piles or "masonry or structure, several strong metallick chains, "parallel to and at suitable distances from each other, which "said chains may be drawn tight by secure mechanical "means; or otherwise the said chains may be suffered to "hang in similar lines, slightly curved from one side or "bank to the other, and in either case I do dispose upon the "said chains longitudinally and crosswise such fit pieces of "timber, or iron, or other suitable material," as shall and may constitute a platform or roadway.

[Printed, 4*d*. No Drawings. *See* Repertory of Arts, vol. 19 (*second series*), p. 215; and Rolls Chapel Reports, 8th Report, p. 83.]

A.D. 1811, April 2.—No. 3429.

BENTHAM, SAMUEL.—"A secure œconomical mode of laying "foundations, and in some cases of proceeding with the "superstructure, of works of stone, or of brick or other arti-"ficially composed materials, particularly applicable to the "projection of wharfs and piers into deep water, to the con-"struction of bridges, and the formation or improvement of "harbours, as well as to the erection of heavy buildings on "bad ground."

The portion of this invention which relates to wharfs, piers, or harbours is as follows:—Stone or other materials are combined together into a number of distinct masses, which together constitute the foundation and more or less of the superstructure. Sometimes one mass may be used, and the whole structure may be included. These masses are placed in their respective situations without the use of a caisson or coffer dam; they are pressed into the ground with sufficient pressure to prevent the further yielding of the ground when the superstructure is built thereon.

To construct a wharf wall, when the ground is levelled, hollow masses, as above, are constructed on a platform; they are then floated to the spot where they are to be deposited. Whilst floating, they are built up higher and thickened at the bottom and lower part of the sides. Water is then allowed to enter the mass under treatment, so as to sink it precisely in the place required, a portion remaining above water at low water. At high water, a laden vessel is brought over the mass

and allowed to fall with the tide upon it. Other masses are similarly brought over and deposited in their places.

Similar methods are described, for piers, breakwaters, embankments, and locks.

[Printed, 10*d*. Drawing. *See* Repertory of Arts, vol. 20 (*second series*), p. 1; also Rolls Chapel Reports, 8th Report, p. 85.]

A.D. 1812, March 5.—No. 3544.

BENTHAM, SAMUEL.—" A new mode of excluding the water " of the sea, of rivers, or of lakes, temporally, during the " execution of under-water works of masonry or other ma- " terials, or permanently for the security of foundations, " applicable, for example, to the construction of sea walls, " wharfs, piers, docks, and bridges."

The chief peculiarities of this invention are :—

The dam is formed either in one piece or in separate pieces; in either case the joints are properly made previously to its being put in its place. In some cases, it may be made to serve again for a similar purpose.

The lower part of the dam is formed so that it may penetrate the ground on which it is placed to a sufficient depth to prevent the passage of water under it.

The lower part of the dam (including that which is in the ground), may be separable from the upper part.

The dam, already made and put together, is brought to the spot on which it is to stand, and then, by the application of weight, is pressed into the ground.

The dam may be moved away from the situation in which it was first used, the lower part being left behind or not.

The drawings show a circular dam formed of staves connected together by rims of cast iron, and separable into two parts. An oblong dam may be made to fit the portion of the wall already executed. Amongst other applications of this invention, three double dams are shown (two side structures, and one in front) to exclude the water during the erection of a sea wall. "The dams themselves may be made of wood, or " of iron, cast or wrought, or of any other suitable material; " and the double dams being hollow, like navigable vessels, " may be made use of as receptacles for materials, the erection " of a steam engine, lodging for workmen, or other purposes " subservient to the carrying on the work."

[Printed, 1*s*. Drawings. *See* Repertory of Arts, vol. 21 (second series), p. 129; and Rolls Chapel Reports, 8th Report, p. 89.]

A.D. 1812, October 31.—No. 3611.

BRAMAH, Joseph.—"Improvements in the methods of con-"structing, laying down, and organising the main and other "pipes for the conveyance of water"; the said water may be applied to other useful purposes.

The third improvement is the only portion of this invention which claims notice here. This improvement consists of the conducting, management, and application of water in open channels, aided by the principle of the hydraulic press, in which plungers made to slide one within the other, after the manner of a telescope, are employed; it also includes the construction of flood gates and other necessary machinery.

"Canals, aqueducts, docks, floats, basons, ponds, harbours, "&c., which can be cleansed at pleasure," may be constructed "in the shape of two canals running parallel to each other, "and forming a conflux at their summit." At each junction of the canals with the source of water supply (sea or river) a pair of flood gates is fixed, and another pair at their conflux.

"To cause artificial currents in navigable waterworks," the same shape of canal as that described above may be used, in connection with a water wheel at the conflux junction.

A method of lifting vessels consists of building a wall or dam at the head of the lower level of the canal up to the surface of the upper level. By the expedient of an overhead railway, a truck may be brought over the upper and lower level, and may thus, by sling chains and hydraulic presses (on the truck itself), be the means of raising the vessel completely out of the water and transferring it to the upper or lower level as the case may be.

The floodgates used by the inventor are constructed on a balance or equilibrium principle.

[Printed, 6*d*. No Drawings. *See* Repertory of Arts, vol. 23 (*second series*), p. 257; also vol. 6 (*third series*), p. 228; and Rolls Chapel Reports, 5th Report, p. 94.]

A.D. 1812, December 19.—No. 3625.

ROGERS, Thomas.—"A method of applying manuel powers "to the crane, pile driver, and other machinery."

The drawing represents a treadwheel worked by a man. The rope which winds round the axle of the wheel is shown raising a large barrel. No especial means of raising the weight, or monkey, of a pile-driving machine is described or shown.

A man or men act by stepping on the periphery of the said wheel, "on or about the plane of the axis, who by his or "their gravity or wheight, and by constantly stepping on the "rungs or steps," "will keep the same in motion, by which "a greater weight will be raised or resistance overcome than "by one or the same number of men in the common way. "But where the weight or other resistance is greater than his "or their gravity is able to raise or overcome, the strength of "the man or men can be employed, in addition to his or their "weight, by the man or men being atatched to the stage or "floor."

A click wheel on the axis prevents the weight running down when the power is not applied; to lower the weight, the pall of the click wheel may be thrown off by a foot lever.

A brake strap can be put into action by means of a hand lever.

Straps may be slipped over the man's shoulders, their lower ends being fixed to the stage, so that the man may apply his strength as well as his weight, when the weight is greater than his gravity will overcome.

The man may steady himself by means of a rope or frame.

[Printed, 8*d*. Drawing. *See* Rolls Chapel Reports, 8th Report, p. 95.]

A.D. 1813, March 23.—No. 3670.

CONGREVE, WILLIAM.—"Modes of constructing the locks "and sluices of canals, basons, docks, and generally for the "transportation of floating bodies from one level to another."

1st. "The hydro-pneumatic double-balance lock." — A middle wall divides the space between the two side walls into two equal parts or locks. Round the inside of each lock, at a small distance from the main walls, a minor wall is constructed; the height of the minor walls is somewhat higher than the difference of level. A subterranean communication is provided between the two locks. Two hollow caissons, one in each lock, are inverted over the minor walls and are connected underneath by a chain which passes over rollers, so that when water, in equal quantities, is admitted to each lock, a quantity of air is confined under each caisson and in the pipe of communication, and when one caisson is raised the other becomes depressed and *vice versâ*. These caissons and the

water above them nearly balance each other, and a small amount of power suffices to set the apparatus in action and to transfer boats thereby.

2nd. "The balloon double-balance lock."—Two caissons or balloons (either open at the bottom or not) are connected by a chain as described above and a complete interior lock (with gates, &c.), is fixed upon each balloon. The gates are adjusted to fit those of the outer lock. The outer locks are half filled with water, and a double spiral wheel, round which the chain passes, regulates the equilibrium.

3rd. "The buoyant plunger lock."—Each lock is disconnected from the other and is more than double the width of the boat, in order to allow of a buoyant plunger to be immersed into or drawn out of the water. The drawing shows the plungers connected by a chain which passes over a double spiral wheel at the top of the middle wall.

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 23 (*second series*) p. 281; also vol. 24 (*second series*), p. 17; and Rolls Chapel Reports, 8th Report, p. 94.]

A.D. 1813, March 27.—No. 3672.

HUGHES, JOHN.—"Method or apparatus for raising gravel "or earth from the bottoms of rivers and pits, and for screen-"ing and delivering the same into barges or other recep-"tacles."

This invention consists "in constructing and adapting to "machinery now in use an apparatus for screening or sepa-"rating the fine sand or gravel from the coarse gravel or "stones, and in placing the said apparatus in such a direction "as to convey the sand or small stuff into one vessel or "receptacle, and the coarse gravel, ballast, or stones into "another, by one operation, or to raise the coarse gravel only "out of the water, leaving the sand or small stuff behind." The inventor calls this apparatus "a drum screen." "One "part of this apparatus may be of a cylindrical or polygonal "form, and hollow, nearly resembling the drum of a dressing "mill, with part of its length perforated or grated, to allow "the sand or small stuff to fall through. It is provided with "a spiral plate or tube, and adapted to a rotatory motion."

To screen the earth below the surface of the water, the apparatus is used of the required length, in conjunction with

a motive power engine, instead of the ordinary chains and buckets; the drum screen is fixed below the surface of the water.

The drawings show a vessel for raising gravel, and with the above apparatus for screening and delivering the same. Buckets bring the earth from the bottom of the river and deliver it into the hopper of the drum screen. On one side of the vessel a sand barge receives the small stuff from the gratings, and, on the other side, a gravel barge receives the coarse gravel from the other end of the drum screen.

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 23 (*second series*), p. 65; and Rolls Chapel Reports, 7th Report, p. 114.]

A.D. 1813, April 14.—No. 3683.

BUSBY, CHARLES AUGUSTIN.—" Methods of constructing locks " or canals, docks, and navigations."

The principles upon which this invention is based are " founded on the following law of statics " applied " to heavy " fluids in preference to solids, and also in preference to solids " and fluids in conjunction; namely, that heavy bodies may " be made to ascend and descend in conjunction by a power " no greater than is necessary to overcome friction and vis " inertiæ, provided the common centre of gravity of those " bodies does not move upwards or downwards."

Let there be two vessels of equal area in horizontal section and having a free communication with each other by means of an underneath conduit. Both are to contain water to the same level, and the depth of one vessel below the level is at least equal to the altitude of the other vessel above the level. Suppose also two ponds, one level with the upper edge of the vessels the other with the said water level, of such size that the surface of each respectively shall not be sensibly lowered by filling therefrom, the said vessels between the two abovementioned levels. In the larger vessel a double piston is to be placed, one piston being at a distance from the other equal to the interval between the levels. Whenever the pistons are depressed (and only then) the ponds communicate with the larger vessel.

The action of depressing the piston by the admission of water from each pond to each part of the piston respectively is to raise the level of the water in the smaller vessel with no

greater force than is sufficient to overcome friction and vis inertia—not allowing for the weight of the piston.

These principles are applied to practice by means of a lock with an aperture in the bottom thereof, together with a double floating cistern, conduits, syphons, and ponds. "Thus by "means of the loss of one-eighth of a lock of water, the sur-"face of the water in the lock may be alternately elevated "and depressed at pleasure."

[Printed, 1s. Drawing. *See* Repertory of Arts, vol. 23 (*second series*), p. 1; Smith's Mechanic, vol. 1, p. 319; and Rolls Chapel Reports, 8th Report, p. 95.]

A.D. 1813, May 31.—No. 3702.

BRODERIP, CHARLES.—A "mode of raising and lowering "vessels from one level to another level of navigable waters."

In this invention, a caisson is raised and lowered, by the assistance of a floating mass, in a well or cavity below the same. The vessel to be transferred from one level to the other is floated into the said caisson; the gates then close, and the raising or lowering commences.

Besides the caisson and buoyant pieces, there are upper and lower troughs, together with a channel for filling the side troughs from the upper level and a like channel leading to the lower level, into which the side troughs empty themselves.

To lower a boat, it is admitted to the upper caisson at the upper level, the gates are closed, and the first-named channel is opened, so as to fill the lower side troughs. The caisson is thus carried down till the lower buoyant piece is completely immersed. The upper troughs are then filled with water from the upper level, and the caisson descends to a regulating stop, so as to be opposite to the termination of the lower canal. The gates are then opened, and the boat floated out.

To raise a boat, it is admitted to the upper caisson at the lower level, and the water is let off from the upper troughs into the channel leading to the lower level; the caisson will rise until the upper buoyant piece entirely quits the water, and the lower troughs "have arrived at the situation where "the bottom of the said trough shall be level with the surface "of the water in the lower channel." The water is then let off from the lower troughs, the caisson ascends to its upper position, and is there stopped.

[Printed, 8d. Drawing. *See* Rolls Chapel Reports, 8th Report, p. 97.]

A.D. 1813, October 18.—No. 3741.

BUCHANAN, ROBERTSON.—" Improvements in the means of " impelling vessels, boats, barges, and rafts, which may be " also applied to the moving of water wheels and windmills, " the raising of water, the dredging, cleansing, or deepening " of rivers and harbours, and the impelling of other ma- " chinery."

This invention "is established" upon the following mathematical theorem :—" If two equal rings or circular lines in the " same plane, or in planes parallel to each other, be conceived " to revolve each upon its respective centre in its own plane, " with one and the same uniform velocity and in the same " direction with regard to parts of the rings or lines alike " situated, and any point be taken in one of the rings or lines, " and a right line be drawn from that point parallel to a line " supposed to join the centres until it meets the other ring or " circle," then "the right line so drawn will be equal to the " line of distance between the centres, and will continue equal " and parallel to that line of distance during the whole of " every revolution so made."

The drawings represent a paddle wheel constructed according to the principle above mentioned. A concentric wheel (or " pitch wheel ") has an eccentric wheel working on the same axis; by means of rods or links centred on the eccentric wheel, paddles centred on the concentric wheel are always kept vertical. In overshot wheels shallow vessels are substituted for floats, and one of the sides of the said shallow vessels turns on pivots to discharge the water at the lower situation of the revolving wheel, a tripping piece being placed there for the purpose. The buckets being emptied above, instead of below, this plan may be applied to raise water. " The dredging from " the bottom of waters may also be performed by scraping " buckets attached to the wheels instead of the paddles afore- " said, and the said buckets, after having charged themselves " by acting upon the ground at bottom, are discharged into " an appropriate channel or conveyance near the top, by the " action of a metallic piece resembling a broad hoe, and " placed there for that purpose."

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 25 (*second series*), p. 5; and Carpmael's Reports on Patent Cases, vol. 2, p. 9.]

A.D. 1815, April 4.—No. 3904.

BAGOT, Thomas.—A "method and machine for passing "boates, barges, and other vessels from a higher to a lower "level, and the contrary, without loss of water."

In the drawings, each lock of a double lock has an exterior and interior wall, and between the two interior walls is placed a "forcing chamber" having valves that open inwards from a conduit in connection with the lower canal, and also valves that open outwards into the lock. There are also "paddles" or sluice doors to cut off the communication between the forcing chamber and either lock, and other sluice doors in the lower gates of each lock. An "evacator" is a buoyant vessel floating in the forcing chamber. The water required to raise a boat is derived from the lower canal. The depression of the evacator shuts the conduit valves, raises the level of the water in the forcing chamber, forces it into the lock and raises the boat to a certain extent. Several repetitions of the depression of the evacator (admitting the water from the lower canal between each depression) are necessary to raise the boat to the level of the upper canal. To lower a boat it is only necessary to open the sluice doors in the lower lock gate.

It is preferred to depress the evacator by means of an hydrostatic press, the piston or ram thereof being made to act downwards.

The walls of the lock are of solid masonry except as set forth above.

The lock gates are hung on the off side of the lock.

In a single lock, the valves are adapted only to the inside of the forcing chamber and of the lock.

The evacator may be worked by the weight of water, in connection with racks, pulleys, wheels, and pinions, or other mechanical means.

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 27 (*second series*), p. 262; and Rolls Chapel Reports, 8th Report, p. 110.]

A.D. 1817, August 26.—No. 4164.

MEDHURST, George.—"An arrangement of implements to "form" "the hydraulic balance, applicable to mechanical "and hydraulic purposes."

Amongst other purposes, this invention is designed to raise vessels upon the water, and for transferring vessels from one elevation to another.

The apparatus consists of a lock or pond of water, within which is an air-tight vessel, closed at the top and open to the water at the bottom, loaded so as just to float under the surface of the water when it is full of air. This air vessel is connected to two plungers which rise and fall in two wells of water, one on each side of the lock. The water in the wells communicates with the water in the lock, so that as the plungers descend in the wells, the water will rise in them and also in the lock.

The use of the air vessel is to give the plungers a uniform degree of buoyancy in every point of their elevation.

The water is raised, by adding a weight to the air vessel, so that it sinks together with the plungers. When the additional weight is removed from the air vessel, it will rise to the surface of the water; or a rope and winch may be used for this purpose. A condensing air pump is fixed upon the timbers or framing of the air vessel, so as to supply it with air when necessary.

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 4 (*third series*), p. 321; also Roll Chapel Reports, 8th Report, p. 122.]

A.D. 1818, November 10.—No. 4302.

BOGAERTS, John.—(*A communication from John Groctaers.*) —"A method or methods for raising and lowering the water "in canal locks."

The lock which forms the subject of this invention may be considered a double plunger lock.

A receiver (or water reservoir) is placed between two locks, and has a longitudinal girder, fulcrum, or prop dividing it equally into two compartments and at the same time supporting a hollow balanced plunger, which is capable of being depressed into one or other of the said compartments, and ejecting the water therefrom into the neighbouring lock, so as to raise the water therein. The plunger consists of a plunger cistern, balanced on the fulcrum and having attached to its under side two air vessels, one on each side of the fulcrum. The air vessels are made of such a shape in connection with

the plunger cistern, as will (when depressed) nearly fill each compartment of the receiver. Water is applied in the plunger, and also in a "compensator," above the plunger, and which moves with it, so that in whatever position the plunger may be placed, it may be in a state of equilibrium or nearly so.

In a modification of this invention, the two locks are constructed in a line with each other, and the receiver is placed on one side of the said locks. The two locks have three gates (one common to both); the fulcrum is opposite to the middle gates and at right angles to the length of the canal. More than one change of position of the plunger may be used to effect the requisite change from one level to the other.

[Printed, 1*s*. Drawing. *See* London Journal (*Newton's*), vol. 1, p. 1; also Rolls Chapel Reports, 8th Report, p. 129.]

A.D. 1819, March 23.—No. 4352.

MORTON, THOMAS.—" A method of dragging ships out of the " water on dry land."

This invention consists " in the application of a particular " kind of carriage to the inclined plane, platform, road or slip " up which the vessel is intended to be drawn."

The carriage has a main or keel beam, to the under side of which frames are fixed to receive trucks, wheels, or rollers disposed at suitable distances asunder; or the under side of the keel beam may slide with any unctuous substance on the inclined plane. The carriage has likewise two or more other such beams to run or to slide on the inclined plane; these beams lay parallel to the keel beam, on each side of the same and at such distance asunder fully equal to the breadth of the largest vessel which the carriage is intended to receive. The parallel beams are united by cross pieces and the carriage is braced by means of ties fixed to the keel beam near its fore end, and attached to the cross pieces in an oblique direction.

The vessel is fixed upon the carriage by means of sliding blocks and shores, and the carriage and vessel are " drawn up " the inclined plane by a capstan or other power."

[Printed, 4*d*. No Drawings. *See* Repertory of Arts, vol. 35 (*second series*), p. 272; London Journal (*Newton's*), vol. 1, p, 17; Parliamentary Report, 1829 (Patent Law), p. 209; and Rolls Chapel Reports, 8th Report, p. 129.]

A.D. 1822, January 29.—No. 4643.

EWART, PETER.—"A new method of making coffee dams."

This invention consists in the application and combination of dove-tailed ribs or ledges, cramps and other parts, for the purpose of making coffer dams of iron or other suitable metal or mixture of metals.

The piles are made of cast iron, and these are united together at their vertical joints or joinings by cast iron cramps. Horizontal joints or joinings are used when additional lengths of piles or plates are required. In some cases, one of the piles or plates is curved "to admit of expansion and contraction in "the line of piles on each side of it." The cramps may be cast in one piece with the piles or plates. Cloth or other substance may be interposed between the piles at their horizontal joints. Guides, rivetted to the piles, may be used to keep the said piles from being forced out of their places by the obstacles they may meet with whilst being driven. The piles with their cramps are arranged like the staves of a cask, and, when the whole circuit is complete, they are driven by means of caps of hard wood. If an obstacle presents itself, the circuit of piles is continued round the said obstacle.

When the ground is easily penetrated, the piles and cramps may be made of wrought iron. When openings are required for letting the water out of or into the coffer dam, these are made in the piles or plates with flanges and valves. When the piles or plates have been some time in the wet, they become rusted together; to get the piles up, in such cases (when the coffer dam is no longer wanted), "a strong iron "bar, having a conical or properly shaped steel point, is "driven down the cavities" of the cramp, "so as to burst off "the cramp where that is wanted to be done."

[Printed, 10*d*. Drawing. *See* Repertory of Arts, vol. 43 (*second series*), p. 193; London Journal (*Newton's*), vol. 3, p. 233; Artizan, vol. 1, p. 47; and Rolls Chapel Reports, 7th Report, p. 123.]

A.D. 1822, September 27.—No. 4710.

FROST, JAMES.—"A new method of casting or constructing "foundations, piers, walls, ceilings, arches, columns, pilasters, "mouldings, and other enrichments to buildings."

This invention consists in so casting or constructing the above mentioned works "that the same may be finished at "once, and in their places as the work proceeds."

In building structures under water, cement is mixed with stones, or other durable substances, and conveyed from above the surface of the water, in boxes or bags, to the surface of the work under the water. A vertical tube or tubes may be employed to discharge the mixture, "and by moving the "upper end of the tubes horizontally, the composition is "regularly and gradually deposited in a soft state, which "quickly hardens to a strong and durable conglomerate "rock;" or, the composition, enclosed in bags, is lowered by tackle to the surface of the work, and there disposed in a regularly stratified manner while the composition is in a soft state. Rough courses are thus formed. To give a smooth face to the work below the surface of the water, piles are driven, and a mould is made round the same; "but in con-"structing foundations with the composition enclosed and "left in bags," "no framework is necessary, and slower "setting cements may in some situations be used, such as "terras, or puzzalano mortars."

[Printed, 4*d*. No Drawings. *See* Repertory of Arts, vol. 44 (*second series*), p. 133; London Journal (*Newton's*), vol. 5, p. 66; and Engineers' and Mechanics' Encylopædia, vol. 1, p. 526.]

A.D. 1822, November 9.—No. 4723.

MOXON, John Dowell.—"Improvements in the construction "of bridges and works of a similar nature."

This invention "consists of a coffer dam, composed of timber "framed-work, without bottom, otherwise built like a lighter, "of any required depth, to be opened and shut by a hinge or "any other convenient mode when in a floating condition, "which frame is to have a number of iron or wooden piles "attached to it to move in loops if necessary in order to fasten "or attach it to the bottom or bed of the river when grounded "by the fall of the tide. The dam cuts into the river bed, "and the piles are then driven to render the whole apparatus "stationary." Clay is placed between the external and internal chambers of the dam.

In another part of this invention, stone piers are faced with cast iron. The casings are clamped together below the level of each course.

Iron boxes or troughs may be used to build the piers of bridges, &c.; these are of unequal size, with grooves at equal

distances and they break joint, thus giving the required stability.

"In extending this system to lighthouses, casts of the pro-
" posed situations can be taken when of rock in its natural
" form without much dressing or levelling, which will make
" the work stronger; and in foundations of softer matter iron
" joined in one entire mass will form a good foundation for
" any superstructure, since no part can sink without the
" whole, and the foundation or bottom plates can be placed
" and affixed to the usual precaution of piles either of iron or
" wood."

Wharf walls can also be constructed upon the above principle,
" which avoids screws, bolts, nuts, or rivets."

[Printed, 2s. Drawings. *See* London Journal (*Newton's*), vol. 8, p. 123; and Rolls Chapel Reports, 7th Report, p. 124.]

A.D. 1824, January 15.—No. 4887.

WHITE, JOHN.—" A floating breakwater."

Logs or pieces of timber, by preference square in cross section, are fastened together so as to form open frames. These are placed on the surface of the waters of the sea, or other waters "which are liable to be agitated by gales of
" wind or by currents of water, tide or flood," and they are secured, by chains connected to anchors or otherwise, so as to float on the surface of the said waters.

From the situation of the place protected, or from the nature of the wood composing the said open frames, or from other circumstances, "it may be necessary or desirable to
" render them more buoyant." In such cases their buoyancy is increased "by firmly fixing thereto empty barrels or hollow
" buoys, or by any other mode usually practised for a similar
" purpose, and as from the situations of the place where such
" open frames are stationed, it may appear most adviseable or
" convenient."

The inventor does not consider himself "confined to any
" precise shape of the said several open frames, or to any
" particular number of pieces of which they may be com-
" posed" but he considers himself "entitled to construct
" them of such a shape and with such a number of pieces as
" the situation and circumstances of the place for which they
" are intended may seem to require."

The drawings show a rectangular framing, put together with double timbers horizontally in one direction, and with double timbers vertically in the direction at right angles to the said horizontal timbers. In another plan double vertical timbers are employed throughout, and double timbers horizontally in one direction only.

[Printed, 10*d*. Drawings. *See* Repertory of Arts, vol. 45 (*second series*), p. 277; and vol. 46 (*second series*), pp. 14 and 140; also London Journal (*Newton's*), vol. 7, p. 232.]

A.D. 1826, January 16.—No. 5319.

KOYMANS, Henry Anthony. — (*A communication.*) —" Improvements in the construction and use of apparatus and " works for inland navigation."

This invention consists of " a self-acting or adjustable sluice " or weir to be applied in any rivers, canals, or watercourses, " in which there is a current or stream, and which by reason " of floods or other causes may be subject to variation in the " height or depth of the water, so as to overflow the banks or " be detrimental to the purposes of navigation."

The leading feature in this invention is a long caisson which is capable of sliding up and down against the smooth faces of vertical posts placed in the watercourse; when down, it prevents the running of the water from the higher level, and when raised, it permits it to pass under the bottom of the said caisson. The quantity of water that is allowed to flow underneath the bottom of the caisson can be adjusted by varying the weight of the caisson; for this purpose greater or less quantities of ballast may be introduced therein, or water, from the upper level, may be admitted between the two bottoms of the caisson, by valves for that purpose. An air well from the upper floor permits the air to escape from between the two bottoms.

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 3 (*third series*), p. 313; and London Journal (*Newton's*), vol. 14, p. 311].

A.D. 1827, July 12.—No. 5522.

DEEBLE, Edward Barnard.—" A new construction or con- " structions, and combination or combinations of metallic " blocks for the purposes of forming caissons, jetties, piers, " quays, embankments, lighthouses, foundations, walls, or

" such other erections to which the said metallic blocks may " be applicable."

The said blocks are hollow frames or boxes made in a suitable form, and of a thickness proportionate to the strength and gravity required in them. Dovetailed tongues and grooves enable these blocks to be combined and fitted together in the most substantial manner.

These blocks may be combined together horizontally, vertically, or in inclined positions, according to the purpose they are intended for. They are preferred to be made of cast iron, and may be formed "with sides and ends to them only, or " with tops or bottoms, or both tops, bottoms, sides, and " ends to them with solid or hollow dovetails, tenons, or " grooves formed within or upon them, for the purpose of " combining them together, and either with or without the " use of plain, square, or dovetail keys." Their sides, ends, tops, or bottoms, may be made solid or with open work as may be required. To save metal, piles or stakes may be driven within or around the blocks; this plan gives them a firmer hold than they otherwise would have upon the bottoms of harbours.

A caisson is described as being made with acute angled blocks combined with obtuse angled blocks. A sea bank is made with blocks of great breadth. A cross bar sling with disengaging gear is shown in the drawings.

[Printed, 10*d.* Drawing. *See* Repertory of Arts, vol. 7 (*third series*), p. 118; London Journal (*Newton's*), vol. 2 (*second series*), p. 203; Mechanics' Magazine, vol. 9, p. 145, also vol. 10, p. 141; Register of Arts and Sciences, vol. 2 (*new series*), p. 71; and Engineers' and Mechanics' Encyclopædia, vol. 1, p. 288.]

A.D. 1827, August 13.—No. 5536.

UNDERHILL, John.—"Improvements in machinery or ap- " paratus for passing boats and other floating bodies from a " higher to a lower, or a lower to a higher level, with little " or no loss of water, which improvements are also applicable " to the raising and lowering of weights on land."

A carriage is employed for this purpose in connection with upper and lower inclined planes. The carriage can be lowered sufficiently deep in the water to allow the boat to float above it. The upper inclined plane is for the front wheels of the carriage, and the lower inclined plane for the

hind wheels thereof, whereby the carriage is preserved in a horizontal position during its ascent or descent. Parts of the horizontal rails in connection with the inclined planes are pivoted, in order to facilitate the transfer of the carriage from the horizontal rails to the inclined planes. A drum with a chain wound round it is employed in raising or lowering the carriage and its load. To guard against the breaking of the chain, additional rails are provided, with ratchet teeth upon them. "Preventer bars" hinder the wheels of the carriage from rising off the rails. A separate drum, in connection with a chain and counterbalance weight, may be used to counteract the downward tendency of the carriage; or two sets of inclined planes, one ascending, the other descending, may be employed for this purpose; or a brake wheel may be used. To effect communication between canals not in a direct line, the carriage and its load may be placed upon a horizontal revolving platform similar to those used in railways.

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 7 (*third series*), p. 239; London Journal (*Newton's*), vol. 4 (*second series*), p. 236; Register of Arts and Sciences, vol. 2 (*new series*), p. 81; and Engineers' and Mechanics' Encyclopædia, vol. 1, p. 300.]

A.D. 1828, May 1.—No. 5646.

BROWNILL, JONATHAN.—A "method of transferring vessels "from a higher to a lower level, or from a lower to a higher "level, on canals," also for raising or lowering other weights, and for other purposes.

Only the tranference of vessels can be treated of in this place.

The weight to be raised is suspended over a double set of pulleys, and between two balance weights; the balance weights are vessels containing water, the quantity of which may be adjusted exactly to compensate the weight to be raised. The shaft (answering to the lock now in use) is provided with sluices, one at the lower canal, the other at the upper. Two axes are supported on bearings which rest on the partition walls of the compartments; each axis carries five pulleys. Ropes that pass across the pulleys are connected, at one end, to the large caisson that carries the barges, and at the other end to balance weights or small caissons that act as balance weights. The large caisson has a double bottom to regulate its weight. The said axes are connected by spur wheels to

preserve uniformity in their motion. By means of an inclined plane fixed to the lock and a lever arrangement on the caisson, the said caid caisson is kept close to the end of the upper or lower level, so as to prevent the escape of water when the boat is passing from the caisson to the canal or *vice versâ*. The large caisson, with its contents, is raised by admitting water into the smaller caissons. "It will be only necessary to re-"verse the operation when it is required to lower a boat from "the upper to the lower level."

[Printed, 1*s*. Drawings. *See* Repertory of Arts, vol. 8 (*third series*), p. 466; London Journal (*Newton's*), vol. 7, (*second series*), p. 78; and Register of Arts and Sciences, vol. 3 (*new series*), p. 33.]

A.D. 1828, September 4.—No. 5698.

FARISH, WILLIAM.—"A method or methods of clearing out "watercourses."

The apparatus or machines comprised in this invention are known as "Jowett's patent machines or apparatus for clearing "watercourses."

This invention consists "in the employment of self-acting "machines, which when filled to a proper height with water, "shall on a sudden empty the said water in such a manner "and with such power as will render it capable of washing "away or removing those substances which lie in the said "watercourses and which it may be desirable to get rid of."

In one form of the apparatus, the back part of a pivoted trough preponderates and keeps the said trough horizontal by resting upon a suitably-placed support. When filled to a certain height with water the front part of the trough preponderates, and the water is suddenly discharged.

In another modification, a pivoted cylinder has an air-hole and lip. The vessel is properly balanced, and stops are provided to prevent the lip from rising too high or falling too low.

A cylinder, mounted as in the last modification, but enclosed, except to supply and exit pipes, may, by its rotation, move a rack in connection with a valve at the bottom of a pond or tank, and thus suddenly empty the water out of the said pond or tank when it has arrived at a predetermined height.

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 8 (*third series*), p. 599; London Journal (*Newton's*), vol. 9 (*second series*), p. 117; and Register of Arts and Sciences, vol. 3 (*new series*), pp. 285 and 346.]

A.D. 1833, January 19.—No. 6367.

AFFLECK, Thomas.—"Improvements in the means and "machinery for deepening and excavating the beds of "rivers, removing sandbanks, bars, and other obstructions to "navigation."

[No Specification enrolled.]

A.D. 1833, June 20.—No. 6438.

GIBBS, Joseph, and APPLEGARTH, Augustus.—"Improve-"ments in the construction of railroads, bridges, piers, jetties, "and acqueducts, part of which may he applied to other "useful purposes."

In the application of these improvements to the construction of bridges, piers, or jetties, foundation plates that support the columns of the above-mentioned structures are secured by bolts and caissons. The floor planks are supported by rail rods and connected with them by means of iron straps furnished with nuts and screws.

In sinking and driving the caissons, a boat is used. This boat is furnished with a well capable of permitting the caisson to pass down it. The driving apparatus is similar to the ordinary pile driver. The pier head may be strengthened by diagonal bolts or rods.

In the drawings is represented a method of forming a foundation by means of cast iron plates connected with bolts anchored in the earth. The vertical rods or bolts, at their lower extremities, are furnished with movable arms or flukes; these, when opened, prevent the return of the bolts. The earth, between the foundation plates and the flukes, may be compressed to any required degree by means of nuts at the upper ends of the bolts. This method may be used for piers, &c.

[Printed, 2s. 2d. Drawings. *See* London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 399.]

A.D. 1833, July 4.—No. 6446.

MITCHELL, Alexander.—"A dock of improved construc-"tion, to facilitate the repairing, building or retaining of "ships and other floating bodies."

This invention consists :—

1st. Of a graving dock with a buoyant flooring. The flooring being held down, by a suitable contrivance, at its level of low water, can be afterwards liberated so as to rise and fall with the tide, and to carry upon it the ship or vessel to be repaired or built. The buoyancy of the floor can be obtained either by air-tight vessels or by the floating power of the floor itself.

2nd. The said flooring can be retained in its situation and guided in its rise and fall either by piles or by means of mooring chains or cordage.

3rd. "The application to the lower end of a wooden pile, "or to a metal pin or shaft, of a broad metal screw or worm, "for the purpose of enabling such a pile or pin to be inserted "or extracted from the ground, by causing it to turn upon its "axis by means of cross levers when it is placed with its "point directed upon penetrable ground."

4th. Of "piles, pins, or shafts, so armed with broad metal "worms or screws, whether the same be employed in the con-"struction of a dock," "or for piling ground for the support "of buildings or embankments, or to obtain a secure hold of "the ground for the purposes of mooring or holding fast "ships and other floating or stationary bodies."

[Printed, 1s. 10*d*. Drawings. *See* Repertory of Arts, vol. 1 (*new series*), p. 69; also vol. 10 (*enlarged series*), p. 115; London Journal (*Newton's*), vol. 4 (*conjoined series*), p. 12, and vol. 30 (*conjoined series*), p. 256; Mechanics' Magazine, vol. 28, pp. 158 and 289, and vol. 46, p. 525; Patent Journal, vol. 3, p. 13; Engineers' and Architects' Journal, vol. 1, p. 22, vol. 2, p. 37, vol. 3, p. 181, vol. 7, p. 68, and vol. 12, p. 85; and Inventors' Advocate, vol. 4, p. 186. Extended for 14 years (*see* No. 11,777).]

A.D. 1833, December 11.—No. 6522.

AFFLECK, Thomas.—"Improvements in the means and "machinery for deepening and excavating the beds of rivers, "removing sand banks, bars, and other obstructions to navi-"gation."

This invention consists in directing, impeding, confining, and restraining the currents of running waters, so that the pressure or running force of such streams may act with increased power upon certain parts of the banks, beds, and shallows, and thus excavate and wash away any obstruction and form new and capacious channels for the free course of the stream and of navigation.

The drawings show this invention applied to practical purposes by means of various kinds of apparatus. In one plan a row of piles driven deep into the sand or mud, are connected at the top by timbers, and form a line so as to obstruct the stream as required. In another plan, a moored vessel, deep in the water, carries a framework of timbers; these timbers or flaps may fold up upon occasion. A timber cross may be held together and weighted by a cast iron central plate. A series of stakes, pile rods carrying a block of timber, a line of flap gates, a line of piling, and portable swinging frames, are also described and shown. Other means consist of, a timber log connected to piles, a series of logs, a line of agitators, a floating beam, a cross frame of timber, a porcupine roller, wedge-formed apparatus, and shutters connected to a pier. Pumps, driven by steam may be made to force water, in jets, against the bottom.

[Printed, 1*s*. Drawing. *See* London Journal (*Newton's*), vol. 8 (*conjoined series*), p. 71; and vol. 4 (*conjoined series*), p. 278; also Rolls Chapel Reports, 7th Report, p. 148.]

A.D. 1835, November 5.—No. 6924.

ADCOCK, Henry.—"Improvements at docks and quays, *to* " facilitate the importation and exportation of merchandize, " and abridge labour."

An arrangement of water wheels, in connection with tanks and raising gear, such as cranes and inclined planes, is applied to the loading and unloading of vessels at docks and quays. The water wheels may be worked either by the tide or by tanks filled by the tide, or by any other water supply.

When the water has worked any of the said water-wheels, it "must be conducted through trenches, and thence again " returned to the waters of the docks or into the tidal stream, " or be discharged into any place, where they will flow freely " away."

In this invention, the difference of level between the water in the docks and that in the tidal stream is utilised in the following manner:—A culvert or drain is made, "four feet, " more or less, below the surface of the waters in such docks " at the lowest know high-water level; such culvert or drain " *is made* to extend throughout the lengths of such docks, or " *quays* respectively in a line of direction parallel with the

" sheds or covered ways of the docks or quays, and as it is " so much beneath the surface of the ground, such culvert " or drain is arched over, and that part of the trench or cut- " ting above the culvert or drain is again filled up with earth, " and paved in the usual manner, so as to bring its surface " equal to the general surface of such docks or quays."

[Printed, 1s. Drawing.]

A.D. 1836, May 13.—No. 7092.

GRAHAME, Thomas.—"Improvements in passing boats and " other bodies from one level to another."

Two small canals are carried forward upon the upper level; they are fitted with floodgates. There are also two parallel dry cuts, of dimensions sufficient to receive certain tanks, and these are met by two lower canals from the lower level, similar to those at the upper level. Three rows of uprights form the sides of the dry cuts, and rise to the top of the upper canals; to each upright there are two wheels on horizontal axes, one at the top and the other at the bottom. These wheels carry endless chains, and the tanks, one in one cut, the other in the other cut, are capable of being raised or lowered by means of endless chains at opposite sides of the same cut; the two tanks, thus mounted, counterbalance each other, one being suspended at the top, the other at the bottom of the descent. Certain dead weights, attached to pipes or conduits, extend all along the chains at the outer sides of the outer pillars; by increasing the weight of the upper load, or by diminishing that of the lower load, the upper and lower tanks may change their respective levels.

Brakes are used, by way of precaution, in this invention.

[Printed, 8d. Drawing. See Repertory of Arts, vol. 7 (*new series*), p. 144.]

A.D. 1836, September 3.—No. 7180.

BUSH, William.—"Improvements in the means of and in " the apparatus for building and working under water, part " of which improvements are applicable to other purposes."

1st. A mode of combining and using double cones or conical frames of wood for constructing the foundations of lighthouses and other buildings below the surface of the water. Two concentric cones on the same base, one wider than the other at the upper part, are sunk in the position required, and the

masonry work is built within them. The foundation being built, the cones are removed.

2nd. "Applying air pumps in diving bells, in place of "pumping air down from above." The pumps are in connection with an air pipe which is supported above the surface of the water.

3rd. Combining a pump with a diving dress or helmet, whereby the diver may supply himself with air from above. The pump is enclosed in an air-tight vessel, which supplies the diver with air to breathe.

4th. A belt is worn to enable the driver to rise or descend in the water, according to whether air is admitted to the said belt, or withdrawn therefrom.

5th. "The application of a compass to the helmet of a "diving dress, to facilitate the diver in ascertaining his "position, or the position of any object below the water." The compass is suspended so that it will at all times retain its horizontal position. The diver may, by looking downwards, readily see the position of any object, and ascertain the direction in which he moves.

[Printed, 1s. 4d. Drawings. *See* Repertory of Arts, vol. 7 (*new series*), p. 300.]

A.D. 1837, July 10.—No. 7399.

WATERSTON, John James.—"Improvements applicable to "the intercepting and directing of currents and waves of "water."

1st. The "hydraulic screen."—This apparatus is to cause banks of sedimentary materials to be produced or augmented; also to reclaim ground from the water. A rigid screen consists of inclined surfaces framed together and sunk to the bottom of the water; this screen deflects "part of the force "of the current downwards." In another rigid screen with a ponderous base, the surface opposing the current is upright. A partially flexible screen is so made as to fold down before the current moving in one direction, and rise and maintain an upright position before a current moving in the opposite direction; it is connected to a heavy frame, sunken so as to maintain its position against the power of the current. A buoyant screen consists of staves connected at their lower extremities to a moored chain cable.

2nd. The "quell water."—This floating apparatus affords the protection of a breakwater, "which will admit of vessels "passing through it during a storm without damage being "sustained on either part." "This is composed of a series "of parallel or radiant lines of frames floating at the surface "of the water," "each line being secured at both extremities "to moorings, but not otherwise connected with the lines "adjacent; the frames of each line to diminish in size "towards the most exposed side of the quell water. The "mode of their construction and connection with the central "line of cable has been designed to combine strength and "lightness, with a certain degree of elasticity of the joints "and facility of being kept in repair."

[Printed, 1*s*. Drawing.]

A.D. 1837, December 19.—No. 7517.

PITCHER, William Henry. — (*A communication.*) — "Improvements in the construction of docks and apparatus "for repairing ships and vessels."

The dock carries, at its upper part, on each side, longitudinal frames, connected to the plungers of hydraulic presses. The presses, two in number, are securely fixed, and mounted horizontally upon brickwork at the end of the dock. The cross heads of the plungers are connected to the frames by connecting rods. To each frame are fixed at suitable intervals, chains that proceed over pulleys, vertically, to cross pieces to which are attached transverse beams for receiving and supporting the keel of the vessel to be raised.

The vessel to be raised for repair having entered the dock, is fixed therein by means of certain toothed triangular pieces in connection with uprights that are fastened to the ship. The force pumps are then worked till the plungers arrive at the end of their stroke, thus raising the vessel by means of the above mentioned frames, chains, and transverse beams. The cross pieces of the transverse beams are represented as sliding in fixed vertical guides attached to the side of the dock. When the vessel is raised, the chains are retained in position by stops or bolts.

To lower the vessel into the water, the stops or bolts are removed, and the water is allowed to flow slowly from the cylinders of the hydraulic presses.

[Printed, 10*d*. Drawing.]

A.D. 1838, July 2.—No. 7718.

TAYLER, Joseph Needham.—Methods of lessening the force of waves, and of reducing them to "broken water," "thereby "preventing the injury done to, and increasing the durability "of breakwaters, mole heads, piers, fortifications, lighthouses, "docks, wharfs, landing places, embankments, bridges, or "pontoon bridges;" also of "adding to the security and "defence of harbors, roadsteads, anchorages, and other "places exposed to the violent action of the waves."

The principle, in this invention, is to oppose "yielding "bodies," instead of a solid fixed resistance, to the force of the waves. These yielding bodies are composed of wood and iron trussed together and they partly float and partly rest upon their keels; in deep water they entirely float.

The drawings show a floating caisson breakwater, of which one-third floats above the surface of the water; this is composed partly of iron and partly of timber. Another floating breakwater "is composed entirely of red pine timber "so arranged that three fourths of the quantity of the timber "will be immersed in the water." These breakwaters are attached to moorings. The moorings are formed of straight-grained timber; they are shackled together by a link of common mooring chain. Sometimes a length of common chain connects these moorings to the anchors or mooring blocks, as they are never intended to strike the ground. In a floating buoy, composed of timber, dovetailed and bolted together, there is a mast about twenty feet high stepped on the deck.

[Printed, 10*d*. Drawing. *See* Repertory of Arts, vol. 17 (*new series*), p. 152; London Journal (*Newton's*), vol. 13 (*conjoined series*), p. 292; and Mechanics' Magazine, vol. 35, p. 354.]

A.D. 1838, August 30.—No. 7789.

KNILL, Henry.—"Improvements in cleansing the bottoms "of docks, rivers, and other waters."

This invention is accomplished "by means of a steamboat "or vessel having a rake or such like proper instrument "for drawing or raking the mud into a tideway or stream, in "order to the same being carried away."

The drawings show a steamboat with a rake towed from the stern thereof by means of rods and chains. The rake is made of wrought iron and has teeth. The rods, being fixed

to the rake, keep it upright and well to its work when the vessel is moving, and the chains proceeding from the rods are attached to the sides of the vessel, one rod and chain to each side. A third chain attached to the rake and passing over the stern is worked by a windlass. "By this arrange- " ment the rake can readily be raised when it is desired to " be put out of action."

In cleansing the bottoms of waters according to this invention, "supposing it to be a dock or other water opening " into a tideway or stream, the steamboat is caused to rake " up the bottom, and thereby to disturb the mud, and to " draw it out towards and into the tideway or stream. The " consequence of such raking or disturbing of the mud will " be that it will mix with the current, and will flow as well " as be raked into the stream or tideway, by which the mud " will be carried away. And in cleansing the bottom of " rivers, particularly in quiet places in some degree out of " the tideway or stream, where deposits of mud accumulate " quickly, the steamboat, by the rake or such like apparatus, " disturbs and rakes the mud, and it flows, as well as is drawn " into the tideway or stream," and thus by this invention may the bottoms of docks, rivers, and other waters be cleansed with facility.

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 12 (*new series*), p. 73; and London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 288.]

A.D. 1839, March 27.—No. 8017.

NEWTON, William.—(*A communication.*) — " Machinery for " cutting and removing earth, which machinery is applicable " to the digging of canals and the levelling of ground for rail- " roads or ordinary roads, and similar earthworks."

The said machinery consists in "a peculiar arrangement " and construction of apparatus mounted in a carriage, in " which a series of rotary cutters or peckers are made to break " the ground as the carriage advances; and also to conduct or " throw the earth thus loosened into a series of travelling " buckets or shelves, which carry it up out of the excavation, " and deliver it into a series of troughs, moving in a trans- " verse direction, for the purpose of carrying off and dis- " charging the loose earth raised into carts or into any " convenient situation by the side of the excavation."

The rotary peckers have teeth which peck into the earth sideways as they revolve, their axes being somewhat inclined to a vertical line. The shafts of cutters or peckers are supported at bottom in sockets formed in a plate called "the in-" clined plane" fixed under the back of the carriage. As it is cut, the loose earth falls upon the inclined plane and is pushed by the arms of the lower peckers into a recess from which it is taken up by the travelling buckets. The buckets are mounted on an inclined endless chain. The discharging troughs are connected to a horizontal endless chain that passes over two tension rollers, and has several intermediate bearing rollers.

The several arrangements for pecking, raising, and delivering the earth, as well as for traversing the carriage, are driven by a steam engine on the platform of the machine.

[Printed, 10*d*. Drawing. *See* London Journal (*Newton's*), vol. 16 (*conjoined series*), p. 57; and Inventors' Advocate, vol. 1, p. 131.]

A.D. 1839, October 10.—No. 8238.

SMITH, JAMES.—"Improvements applicable to canal navi-" gation."

1st. "A new and peculiar mode of lockage, whereby the " vessels or boats passing along the line of canal rise or drop, " as the case may be, from one level to another without having " to be stopped." This result is attained "by confining the " difference of altitudes at each lock to from twelve to eighteen " inches, and by allowing the vessel to pass over the lock " gates, depressing them under water to the depth of the " draught of the vessel."

In this invention, the canal at the place of the lock is contracted, and the lock gate is hinged, by a horizontal hinge, to a sill nearly on a level with the bottom of the canal, so as to be watertight or nearly so. The pressure of the head of water in the upper level of the canal keeps the gate tight up to "checks" at the sides of the lock, the checks being at about forty-five degrees to the horizon. When a vessel arrives at a lock gate, its temporary prow presses against a roller at the top of the gate and bears it down, thus admitting the vessel to the higher or lower level, as the case may be, and allowing a small quantity of water to pass from the higher to the lower level. As soon as the vessel has passed through, the pressure of water shuts the gate.

The second improvement relates to propelling boats and has no reference to subjects treated of in this series of Abridgments.

[Printed, 10*d*. Drawing. *See* Repertory of Arts, vol. 14 (*new series*), p. 148 and Inventors' Advocate, vol. 2, p. 243.]

A.D. 1841, February 16.—No. 8848.

SCAMP, William.—"An application of machinery to steam "vessels for the removal of sand, mud, soil, and other matters "from the sea, rivers, docks, harbours, and other bodies of "waters."

This invention relates to a mode of applying an apparatus, in combination with the propelling machinery of a steamboat, to agitate the sand or other matters "at the bottom of the "water of the sea, rivers, docks, harbours, and other bodies "of water, and thus to cause the same to mix with the sur-"rounding water, and by the flowing off of the water to re-"move such sand, mud, soil, and other matters which may "from time have settled from the place where the same has "accumulated."

The drawings represent the said apparatus or agitator at the stern of a steamboat. This agitator is a cylinder having spikes or teeth; it is mounted in bearings at the lower extremities of two side rods that are supported at the sides of the vessel (one on each side) towards the stern. The upper axis, on which the rods are capable of free motion, receives rotary motion from the paddle shaft of the engine and the motion of the upper axis is communicated to the lower axis by means of pulleys and endless chains. The forward motion of the vessel combined with the rotation of the agitator tends to remove the sand, &c.

"When the agitator is not required for use, it is to be raised "out of the water by the chains and windlass for that pur-"pose."

[Printed, 10*d*. Drawing. *See* Mechanics' Magazine, vol. 35, p. 207; also Inventors' Advocate, vol. 5, p. 133.]

A.D. 1841, March 17.—No. 8887.

WELLS, Henry Augustus.—"Improvements in machinery "for driving piles."

[No Specification enrolled.]

A.D. 1841, September 6.—No. 9068.

PELLETAN, PIERRE.—"Improvements in propelling fluids "and vessels."

The portion of this invention which relates to emptying docks or reservoirs consists in the application, to these purposes, of the combined forces of steam from a boiler mixed with the gases from the furnace of the said boiler.

The steam and gases are conveyed to a slide valve apparatus which is worked by a small steam engine supplied with steam from a small steam pipe in connection with the said boiler. The slide valve admits the steam and gases into inflatable bags alternately, and the inflation of the said bags drives a stream of water alternately through two horizontal main pipes, corresponding respectively to the bags. A rising main and slide or stop valve is connected with one or both of the said horizontal main pipes, thereby enabling draining to be effected or the raising of water for other purposes to be accomplished.

The drawings show the boiler, steam engine, slide valves, and horizontal main pipes placed in a vessel for the purposes of propulsion.

To economise fuel, instead of leading the pipe conveying the steam and gases at once into the slide valve box, it is lead into a second boiler, "to expend its heat in heating the water in "this second boiler." The steam pipe from the second boiler is lead round the furnace flue of the first boiler getting additional heat until it enters the said slide valve box.

[Printed, 1s. Drawing.]

A.D. 1841, September 21.—No. 9094.

BUSH, WILLIAM.—"Improvements in the means of and in "the apparatus for building and working under water."

This invention "relates to means and apparatus for working "under water, in order to produce excavations and building "foundations of lighthouses, piers, jettys, and other structures "under water."

The invention consists in "constructing the interior of a "caissoon in such manner that the work people may be sup-"plied with compressed air, and be able to raise the materials "excavated, and to make or construct foundations and "buildings."

The caisson is made of cast-iron plates, its upper part rises above the level of the water, its lower part rests on the

bottom that the foundation is to be commenced upon. The interior of the caisson is divided into four separate compartments. The lowest compartment is that in which the workmen work, and it serves the purpose of a diving bell, for it receives air for the men to breathe and to keep out the water. A manhole, closed by a valve, connects this chamber with an intermediate chamber, and the latter chamber is connected to a third chamber that proceeds to the upper air, by two manholes, also valved. The third chamber contains an air pump. A fourth chamber, surrounding the upper part of the third chamber, can be charged more or less with water to sink the apparatus. The intermediate chamber enables the excavated earth to be raised. The lower chamber is considerably filled with masonry, and the whole of the interior works of the caisson removed gradually, the building being continued. The upper part of the caisson may be removed or it may remain to constitute a portion of the building.

[Printed, 1s. Drawing. See Mechanics' Magazine, vol. 46, p. 169; Exchequer Reports, vol. 9, p. 651; and Law Journal (Exchequer), vol. 23, p. 257.]

A.D. 1841, September 21.—No. 9096.

DUNCAN, JOHN.—(*A communication.*)—" Improvements in " machinery for driving piles."

" The object of the invention is so to construct machinery " for driving piles that the machinery may travel pro- " gressively along the piles which have been driven by such " machinery, and by means of a suitable saw to cut off the " upper ends of the piles to the height desired."

" The pile-driving engine is mounted on a carriage with " wheels, such wheels being guided in their progress along the " tops of the piles by temporary rails or other suitable sur- " faces thereon, and which are readily applied to and moved " from the piles as the carriage progresses."

The framings and uprights are of the ordinary construction, as well as the monkeys and weights. Flanged wheels, attached to the horizontal framing enable the apparatus to travel on a temporary railway. A circular saw, mounted on a radiating and moveable arm is actuated from the driving shaft through bevil gear.

A Disclaimer was enrolled, July 31, 1845, by Joshua Burrows Hyde and John Barker Huntingdon, to whom the

interest in the Patent was assigned by the above-mentioned John Duncan. In this document, that part of the Specification which claimed "the application of a steam engine to "pile-driving machinery, in order by such power to raise "the monkey or weight," is disclaimed.

[Printed, 10*d.* Drawing. *See* London Journal (*Newton's*), vol. 22 (*conjoined series*), p. 31.]

A.D. 1842, February 8.—No. 9247.

SLEIGH, ADDERLEY WILLCOCKS.—" Methods of effecting and "forming sheltered floating harbours of safety by the em- "ployment of certain buoyant sea barriers applicable thereto, "and which said improvements are also applicable to and "useful for the formation of breakwaters, floating bridges, "lighthouses, and beacons, the protection of pier heads, "embankments, and for other similar purposes."

These breakwaters consist of portable sloping platforms, partially immersed in the water, employed for the above-mentioned purposes. The said platforms are supported by floating hollow vessels or caissons, by which they are always maintained in a sloping position and are enabled to rise and fall with the tide. The caisson is either made of ribs of timber planked on the outside, or of sheet iron; it is in the form of "an oblong longitudinal wedge." The bottom of the caisson is flat, and its upper surface rises at an acute angle from the extreme edge of the bottom. A strong timber "keel" extends through the centre of the caisson, and the top, bottom, and sides of the said caisson are supported and strengthened by stays. The platform is in imitation of the slope of a supposed beach. To form a sea and wind barrier, a suitable number are moored side by side, and they are connected together by ball and socket joints or links and toggle joints placed at the ends of the keel. The drawings show a harbour of refuge, in which the connected breakwaters are moored to the bottom of the sea. In modifications of this invention, the sloping platform may be attached to a floating framework, or it may be borne by a raft; it may even be used without any floating support, one edge being connected to the bottom of the sea.

[Printed, 1*s.* 8*d.* Drawings. *See* London Journal (*Newton's*), vol. 24 (*conjoined series*), p. 97; Mechanics' Magazine, vol. 37, p. 213; and Record of Patent Inventions, vol. 1, p. 4.]

A.D. 1843, March 18.—No. 9670.

PIM, WAKEFIELD.—"Improvements in the construction or "formation of buoys or other watermarks."

The buoys made according to this invention have the lower end open for the admission of water for a certain space; apertures at the upper part of the open compartment allow the air to escape. The said buoys may be made of iron, wood, or other materials.

The method of construction of these buoys renders them "more efficient in service in consequence of greatly increasing "the lightness or buoyancy, and also reducing the amount "of ballast with which they are usually charged to enable "them to preserve their erect position in the water. Buoys "made in the ordinary manner (when of considerable size) "with closed ends top and bottom, require several hundred "weight of ballast to bring them 'over end,' or cause them "to float in an erect position (or nearly so) in the water; "which ballast or weighting compels the buoy to be im-"mersed fully one half in the water. One of the most "important objects of a buoy is, that it may be seen as far "off as possible, and consequently, the less it is hidden by "immersion, of the greater service it becomes; and another "great feature in its construction is lightness, as by weight "the difficulties of mooring and unmooring the buoy is much "increased."

The closing plate at the underneath part of the buoy is nearly one third of the length of the buoy upwards; it closes the air chamber and supports the necessary ballast.

[Printed, 6*d*. Drawing. *See* London Journal (*Newton's*), vol. 23 (*conjoined series*), p. 404; and Mechanics' Magazine, vol. 40, p. 14.]

A.D. 1843, March 21.—No. 9674.

TAYLER, JOSEPH NEEDHAM, and SMITH, WILLIAM HENRY.— "Improvements in breakwaters, beacons, and sound alarms, "also in landing or transmitting persons and goods over or "through strata or obstructions of any nature, all of which "may be used either separately or in combination."

Only those portions of the invention which refer to breakwaters and beacons can be treated of in this place.

In one instance of a floating breakwater for deep water, the *transverse double* beams, embracing the timbers on each side

are so placed as to form nearly equilateral triangles with the timbers when viewed endwise. A system of diagonal fastening is effected throughout. Galvanized iron bolts are used together with Jeffrey's marine glue. The mooring chains pass over a longitudinal main double beam situate near the line of floatation. The buoyancy of the structure is increased by means of pieces of cork cemented with Jeffrey's marine glue.

A simple floating breakwater may be formed by arranging its timbers and beams so as not to require scoring and facing; they are secured by bolting and glueing.

In another breakwater there is an inclined open framework which swings upon pivots and also has mooring chains and screwed piles. A floating breakwater is placed outside this submarine structure, to receive the top sea.

The floating beacon is formed by "two cones united at the " smaller ends, the upper one inverted and the lower one " direct." A day beacon or beacon buoy consists of an upright mast which is passed loosely through a bouyant vessel filled with cork and firmly secured to a mooring block.

[Printed, 2s. 8d. Drawings.]

A.D. 1843, March 27.—No. 9680.

BROWN, Sir SAMUEL.—"Improvements in the construction " of breakwaters, and in constructing and erecting lighthouses " and beacons, fixed and floating, and in apparatus connected " therewith, and also in anchors for mooring the same, which " are applicable to ships and vessels."

The floating breakwater is wholly composed of wrought-iron bars or plates; a part of the bars are angle iron. There is wrought-iron framing in the interior. Air-tight vessels, fitted close between the beams, extend the whole length of the breakwater. The breakwater has a chain bridle.

The fixed breakwater may either be constructed of iron or timber; if of iron, it is preserved from oxidation by zincing or coppering; if of timber, it is preserved from marine animals by Payne's preparation. The breakwater is constructed in a series of lengths, laid down, end to end, either in a straight line or in a curved line according to the locality. In the section exposed to the sea, the whole of the bars employed are riveted to each other wherever they impinge, and the

ends are all bent over so as to overlap wherever they terminate. This breakwater is floated by means of tanks, &c., towed to its destination, and allowed to take the ground by the tide.

The anchor is of annealed malleable cast iron, and the transverse section of its shank is in the shape of a cross.

The metallic column for the exhibition of sea lights is of metal of a suitable thickness; the lower part of its interior is filled with earthy material. Each part or joint is floated to its destination.

A floating lighthouse is steadied by a weight; it is also moored by a chain to a single anchor.

A spindle floating beacon, upon the same principle as the floating lighthouse, is also described and shown.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1843, July 24.—No. 9850.

NASMYTH, James.—"Improvements in machinery or apparatus for driving piles, part or parts of which improvements "are applicable also to forging and stamping metals, and "other substances."

The weight of a pile-driving machine is raised by the direct action of a steam cylinder; it is then allowed to fall on the head of the pile.

The weight of the block or ram, together with the weight of the apparatus attached thereto, aids, by its continual pressure, in predisposing the pile to sink into the ground.

Additional energy is given to the descent of the ram by the elasticity of compressed steam or air superadded to the force of gravity.

The valve which admits the steam to lift the ram is itself opened by means of the direct action of the elastic force of the steam.

After the blow is given, the point of a trigger is released from a lip on the valve rod; the pressure of steam on the top of a small piston then forces down the valve, so as to re-admit steam from the boiler. This is followed by the rise of a ram, and the above-mentioned effects then take place, so as to cause this pile-driving machine to be self-acting, so far as a series of blows is concerned.

[Printed, 1*s*. 6*d*. Drawings. *See* London Journal (Newton's), vol. 25 (*conjoined series*), p. 1; Mechanics' Magazine, vol. 48, pp. 72 and 75; and *Practical Mechanics'* Journal, vol. 1, p. 77.]

A.D. 1843, December 5.—No. 9975.

POTTS, LAWRENCE HOLKER. — "Improvements in the con-
" struction of piers, embankments, breakwaters, and other
" similar structures."

1st. The employment in the said structures of hollow piles, sunk "into their places by the abstraction of the natural " foundation into which they are sunk, by suction." The pile is allowed to drop through the water into the sand. The top of the pile has then an air-tight cap fitted upon it, which is connected by means of a flexible tube to a receiver. An air pump connected to the receiver on the opposite side exhausts the receiver and draws up a mixture of sand and water. As the sand is pumped up the pile descends by its own weight, and by the pressure of the atmosphere. Modifications of this plan are used in combination with a large pipe or hollow pile and flexible tube.

2nd. The employment of the said hollow piles in "connec-" tion with skeleton frames and tank-like cases, to form " piers, embankments, breakwaters, and other similar struc-" tures."

3rd. The employment "of chemical substances, simple or " compound, to agglutinate, indurate, and consolidate or " support the soil" in which the said hollow piles are inserted. It may be expedient to indurate the bottom soil by means of hydraulic or other lime, or by chemical pastes or solutions, sent down through the hollow piles.

4th. The employment of dry cement in the construction of the said structures. "The dry cement may be delivered at " the spot where it is required through a continuous tube " from the surface of the water."

[Printed, 1s. 4d. Drawings. *See* Mechanics Magazine, vol. 40, p. 433; Artizan, vol. 5, p. 226; and Engineers' and Architects' Journal, vol. 7, p. 238.]

A.D. 1844, January 30.—No. 10,026.

PHYSICK, HENRY VERNON.—"Improvements applicable to
" applicable to machinery for driving piles."

1st. The employment of an endless chain for raising the monkey, and the means of guiding it as it travels.—A hori-*zontal base frame* is mounted on wheels, and supports a *braced upright*, from the top of which a horseshoe formed bar

of iron projects in order to hold the vertical rail upon which the monkey slides. The rail has a pulley at its lower extremity and another at its apex; these pulleys sustain between them a flat endless chain that carries up the monkey when it has delivered its blow.

2nd. Supporting and conducting the chain in a groove formed in the leading rail.

3rd. The construction of the monkey and its appendages.—The block of the monkey is formed by two pieces bolted together. Antifriction rollers at its back work against guide bars affixed to the leading rail, and a lever catch at its upper part in conjunction with a projecting arm suitably fixed on the leading rail, causes the monkey to fall on the head of the pile.

4th. To drive a pile which is not exactly in front of the machine, the whole of the front part of the driving apparatus can be turned round upon a vertical axle; it can also be shifted in a lateral direction or inclined.

5th. In a modification of this machine which carries two monkeys, an auger is shown that is mounted so as to bore a horizontal hole in the pile.

6th. To draw a pile, it is first loosened by lateral blows, and then raised by clips attached to the rope that holds up the monkey. The weight of the monkey draws up the pile.

7th. One pile guides its neighbour by means of a rib of wood. The recesses between the piles are filled with well rammed clay.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1844, April 10.—No. 10,141.

AITKEN, JOHN. — "Improvements in water machines or " engines on steam engines, and the mode of traction on or " in canals or other waters."

The improvements in this invention which can be treated of in this series of Abridgments are the 1st, 4th, and 5th.

1st. "Working dredging machines for cleansing and deep- " ening tideways of rivers by means of power obtained from " the tide." The dredging machinery is sustained by a suitable vessel, and is driven by an undershot water wheel, which *communicates* motion to the main shaft.

4th. "A mode of traction on or in canals and other waters, "by means of atmospheric pressure acting into a partial "vacuum obtained by water." The pipe in which the vacuum is obtained is placed longitudinally just below the surface of the water, so that upon the water being withdrawn from its interior, a travelling piston is propelled. The pipe has a longitudinal slit with a valve, so as to allow of the piston being connected to a vessel on the water, and to move the said vessel as carriages are moved on atmospheric railways. As the longitudinal valve is lifted the pressure of the air forces water into the traction pipe, and the air and water press forward the piston into the vacuous pipe. Water eduction ways and transverse valves are used for the production of the vacuum. The correct working of the valves may be facilitated by the use of the electric telegraph.

5th. A mode of loading or discharging ships by means of the power of the tide in tidal rivers. A water wheel carried by a suitable raft is brought alongside the ship and made fast. Driving bands communicate motion from the water wheel to pulleys on board the ship.

[Printed, 8*d*. Drawing. *See* Mechanics' Magazine, vol. 42, p. 172; London Journal (*Newton's*), vol. 26 (*conjoined series*), p. 319; and Engineer's and Architects' Journal, vol. 7, p. 408.]

A.D. 1844, May 22.—No. 10,195.

BREMNER, JAMES.—"Arangements for constructing har"bours, piers, and buildings in water, for cleansing harbours, "and for raising sunken vessels."

The parts of the invention which relate to harbours, piers, and buildings in water are:—

A wall may be built near to a quarry, and floated to a distance, and then placed where it is to remain permanently. For this purpose a floating structure is built in compartments of two distinct kinds or sets; one set is to contain the wall, the other set to afford buoyancy to the structure. The floatation compartments surround those for containing the wall; "they may be of any convenient number and size; each is to "be furnished with the means of letting in the water when "required, and at other times to be perfectly water-tight."

Another part of this invention consists in the application of the said floating structure or vessel to cleansing harbours. "*A large quantity* of water may be transferred to the place

" at which its scouring effects are required and confined untill " low water, and the slip bottom ends being let go, the water " may be suddenly discharged, so as to produce an excellent " scourer for cleansing the harbour."

Another part of this invention consists in arrangements for driving the piles occasionally required in constructing buildings in water. In one instance, a pile engine drives three piles at once, the outside ones forming guides. Piles may be driven to any depth by means of spars, and at first as sheer poles lashed with small chains; each length is screwed on at the scarf, and the driving operation repeated.

[Printed, 10*d*. Drawing. *See* London Journal (*Newton's*), vol. 26 (*conjoined series*), p. 387; and Engineers' and Architects' Journal, vol. 8, p. 53.]

A.D. 1845, April 2.—No. 10,585.

MULLEY, WILLIAM ROBINSON, and MASON, GEORGE, junior.—" Improvements in collecting and raising stone or substances " from below water."

The object of this invention " is to apply the power of steam " in a suitable vessel to drag dredging bags, and to raise " them and cement stone or other matters collected thereby " into the vessel."

The dredge consists of a strong wrought-iron frame, the lower edge of which is curved and steeled being sharp the more readily to collect. To retain the substances collected, a bag of chain network is fastened to the frame. " At the ex-" tremity of the bag a provision is made more readily to " discharge the substances collected ; " the disengagement of a chain or pin releases a rod.

The hoisting chain of the dredge passes over a sheave at the gib-head to a windlass, which is driven from the paddle shaft by means of a pinion, chain, and chain wheels. The machinery is arranged so that when the dredge and bag is hoisted sufficiently high to discharge its contents into the vessel, the motion of the windlass is stopped by a lever which is operated upon by the hoisting chain passing through a collar, to which small chains are brought, operating on the lever, whereby the clutch which connects the moving power with the pinion is disengaged. The windlass is retained in its position by a brake wheel.

[Printed, 10*d*. Drawing. *See* Repertory of Arts, vol. 6 (*enlarged series*), p. 285; and Engineers' and Architects' Journal, vol. 9, p. 16.]

A.D. 1845, June 3.—No. 10,705.

BRENT, William Brent.—"Improvements in machinery for "cutting or excavating and removing earth."

These improvements "are particularly applicable to cutting "trenches in the ground for the construction of railways or "canals."

The machine which is the subject of this invention is formed by combining several horizontal frames one upon another. A series of these frames are connected and fastened together by vertical bolts, the lower frame having brackets attached to its under side to support the axles of running wheels, whereby the whole is made to constitute a carriage which may be drawn forward by horses. In each frame segmental lever cutters are mounted upon studs; they have springs behind them and stops to "limit the extent of the cutters receding "inwards." The cutters are horizontal as well as vertical, the horizontal cutters being brought into action after the excavating of the trench has been carried on to a certain depth. In this way portions of earth are separated by cutting incisions both vertically and horizontally, and when that has been sufficiently effected, the earth is removed in large clods by any convenient means.

[Printed, 6*d*. Drawing.]

A.D. 1845, July 29.—No. 10,790.

BROWN, Sir Samuel.—"Improvements in the formation of "embankments for canals, docks, and sea walls, and in the "conveyance and propulsion of locomotive engines and other "carriages or bodies on canals and other inland waters, and "also on rail and other roads, and in propelling vessels on "the ocean and navigable rivers."

The only portion of this invention which belongs to this series of Abridgments is, the formation of the said embankments.

The improvements in the formation of embankments consist in constructing thin walls of bricks set in mortar, about a foot apart; the space is filled in with concrete. Another plan is to drive a single row of sheeting piles, tongued and grooved, below the foundations within the outer and inner walls. The work exposed to the sea may be protected by a bulwork of

rubble without mortar. For an inland canal a common earth work embankment will suffice, "and the narrow brick walls, " or the sheeting piles before mentioned, built in the centre " of the embankment, will render it completely water-tight, " as if the whole embankment or sea wall was impervious."

[Printed, 1s. Drawings.]

A.D. 1846, February 11.—No. 11,077.

CLARKE, Thomas, FREEMAN, Mark, and VARLEY, John. —" Improvements in obtaining and applying motive power, " parts of which are applicable to the regulating and control- " ling of fluids."

The 8th head of this invention consists "in a method of " applying the motive power obtainable from the pressure of " the atmosphere, or of steam, or of compressed air, to the " working of pile-driving engines."

In one instance, the ordinary framing of a pile-driving engine supports a vertical tube or cylinder having a longitudinal slit in it similar to the traction tube of atmospheric railways. A piston of a semi-globular form is linked to a connecting plate which slides on guide wheels in the longitudinal slit and has the monkey suspended from it. The cylinder is closed at the top, but a flexible tube "serves to establish a " communication between the upper part of the cylinder and " an exhausting apparatus." "The lower end of the cylinder " is left open. The monkey is raised by exhausting the air " from the top of the cylinder and admitting the external " atmosphere beneath the piston, and is let fall from the top " in the usual way." Another pile engine on the same principle, but with two tubes, is shown in the drawings.

In another instance, an exhausting cylinder without any slit is employed. This cylinder is inclined and is open at the top; it is connected at the bottom to the exhausting apparatus. A chain proceeds from a piston in the tube over a pulley to a counterbalance weight attached to the monkey. This arrangement is worked by the hand lever of a valve.

Low or high pressure steam may be used in these machines instead of air; in this case there is no slit in the tube.

[Printed, 7s. 6d. Drawings. *See* Mechanics' Magazine, vol. 45, pp. 217 and 252; *and* Engineers' and Architects' Journal, vol. 10, p. 91.]

A.D. 1846, March 25.—No. 11,151.

TAYLER, Joseph Needham.—" Improvements in propelling " vessels," also " improvements in constructing vessels so as " to be used in combination with certain machinery or appa- " ratus for removing sand banks and other obstructions to " navigation, part or parts of which machinery or apparatus " may be used on railways, or may be adapted and applied to " carriages on common roads."

The portion of the invention which relates to removing sand banks, &c. has for its object the peculiar construction of certain vessels fitted with the inventor's propellers, or other propelling machinery, and the combination therewith of apparatus by means of which sand, &c. may be raised from the bottoms of rivers and of the sea. By means of this invention harbours may be formed.

The invention consists in a form of vessel " whereby great " strength is secured for the after part thereof, as well as " extra support for the deck. To the stern of the vessel so " constructed is attached the upper end of an inclined frame, " on the lower end of which is worked an instrument or in- " struments for raking or gathering up the soil and turning " it into a bucket, or a series of buckets on an endless chain, " which pass up the inclined frame and empty their contents" into a barge " astern of the vessel, or into a carriage on board " the vessel, which carriage passes along a tram or railway " formed on the deck, and the soil or ballast is ultimately " deposited in the hold or carried away from the vessel."

When the ground requires breaking up in order to be removed, a toothed blade is mounted on an axis for that purpose; when the earth is hard a screw shaft in a tube is used.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1846, July 14.—No. 11,292.

KNIGHT, George. — " Improvements in excavating and " dredging; also in the formation of permanent and tem- " porary harbours, canals, bridges, docks, and other similar " works, and in the apparatus to be employed therein."

That portion of the invention which relates to excavating and dredging is not included in the present series of Abridgments.

This invention relates to the construction of walls, piers, and other similar erections by means of a "water fender," aided by a flexible pipe or mud or sand-extracting syphon and culvert. The fender is constructed of strong convex iron plates; they are joined by dovetailed grooves into which dovetailed rods slide. Transverse rods are extended backwards so as to support the plates in a nearly vertical position.

In the syphon, a flexible pipe is bolted to a hole in the water fender; its outer end is in the water and has a flattened mouthpiece which opens downwards; its inner end is furnished with a face valve that establishes communication between the sides of the fender.

To detach fragments of rock that obstruct navigation, crowbars are inserted into the fissures (by means of the telescope herein-after explained) and their upper extremities are connected to a vessel that sinks with the tide and thus exerts power upon the crowbars. To carry away the obstruction, tackling is used in connection with a floating vessel.

A submarine telescope consists of two pipes, one for the transmission of light, and the other for viewing the illuminated object.

[Printed, 1*s.* 6*d.* Drawings. *See* London Journal (*Newton's*), vol. 30 (*conjoined series*), p. 75.]

A.D. 1846, August 19.—No. 11,343.

HAMILTON, SAMUEL HAVEN. — (*A communication.*)—"Im-"provements in machinery or apparatus for dredging or "excavating."

This arrangement of machinery is called a "submarine ex-"cavator or dredging machine." The principal features of novelty in this apparatus are:—"Firstly, the adaptation of "shovels or scoops hanging as levers, and fitting the com-"partments or boxes formed in a frame, which shovels or "scoops, by their inclined positions when let down, are "enabled to penetrate into the soil, gravel, sand, or other "material, as the apparatus is moved onward; and when "such shovels or scoops are drawn up, closing the bottoms of "the said compartments, so as to form vessels or receptacles "for material so excavated." And, secondly, "constructing "and suspending such excavating or dredging machinery or "*apparatus* between or within boats or rafts, or other buoyant

"supports, so that the said machinery may be lowered to its "work, or raised out of the water, and floated from place to "place."

The drawings show a rectangular frame with scoops, as above described, and having a series of coulters at the front part of the bulkhead of the frame; the said front part of the frame being guarded by a bulkhead which gives it the appearance of a boat's head. In bringing the excavating machinery into operation, it is placed between two flat-bottomed boats, which are connected together by planks affixed to strong uprights. Winches on the boats act upon chains attached to transverse shafts under the connecting planks; by this means the excavating machinery is raised or depressed. The whole apparatus is drawn slowly forward by a steam tug. A quadrant plate combined with a plumb lever shows the depth of the ground below the surface of the water.

[Printed, 10*d.* Drawing. *See* London Journal (*Newton's*), vol. 30 (*conjoined series*), p. 399.]

A.D. 1846, August 29.—No. 11,356.

HOLDSWORTH, Arthur Howe.—"Improvements in buoys, "and in giving buoyancy to buoys."

From the context in the Specification, it would seem that the latter part of the above title should be "giving buoyancy "to boats."

The invention "consists of the application of india-rubber "(caoutchouc) which has been so chemically treated as to "retain its elasticity and pliability under varying tempera-"tures of extreme heat and cold, such descriptions of india-"rubber when used for such purposes being made into tubes, "vessels, or hollow apparatus capable of retaining air "therein."

A life buoy made according to this invention consists of a tube, with cords fixed to it, to attach it to the body."

"Watching buoys" are constructed in the form of a globe, or of a tube with semicircular ends. Of whatever shape or size the said buoy may be, it is enclosed in a net made of strong cords; the opening of the net is brought together and secured to a metal ring, to which the buoy rope or mooring chain is attached, so that the strain may be entirely upon the net within which the buoy is retained. "Each tube or vessel

"used for a life buoy or for a watching buoy is to have an "instrument fixed, so as to allow of the vessel being filled "with air, and the air retained, as is well understood when "making other flexible air vessels."

That portion of the invention which relates to giving buoyancy to boats does not belong to the subjects treated of in this series of Abridgments.

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 9 (*enlarged series*), p. 215; London Journal (*Newton's*), vol. 30 (*conjoined series*), p. 169; Patent Journal, vol. 2, p. 672; and Engineers' and Architects' Journal, vol. 10, p. 145.]

A.D. 1846, December 21.—No. 11,499.

BORRIE, PETER.—"Improvements in the construction of "piers and harbours."

1st. Improvements in the construction of low water piers.—These piers consist of three parts, namely, "a fixed pier or "jetty, a floating pier or barge, which is kept in its place "longitudinally and laterally by a pier or buttress at each "end, but which is at liberty to rise and fall with the tide; "and a bridge strongly hinged on the end of the fixed pier, "and resting on the floating pier so as to form a communica-"tion between the two at any state of the tide."

In a pier for light traffic piles and wooden framings trussed with tension bars are used as piers to rest the roadway on. The floating barge is built of iron and has two water-tight bulk heads. The beams of the bridge are strengthened by tension bars, and the brackets or sockets of its hinges are formed of cast iron bolted to the end pier of the jetty. A wrought-iron bolt forms the pin of the hinge.

A pier for heavier traffic is constructed in a similar manner, but its barge has cranes, and there is a double joint between the bridge and the barge.

A pier for traffic of the heaviest description is like the two former, but is constructed principally of iron. When the floating pier or barge is exposed to the sea, it may have open-ended water-tight tubes to break the shock of the waves. There are modifications of these piers.

2nd. An improved method of constructing floating break-waters. The framework which breaks the force of the waves

contains within it a sheet-iron horizontal cylindrical caisson. Suspended below it is a longitudinal ballast box.

[Printed, 3s. 4d. Drawings. *See* Repertory of Arts, vol. 10 (*enlarged series*), p. 65; Patent Journal, vol. 3, p. 125; and Engineers' and Architects' Journal, vol. 10, p. 247.]

A.D. 1847, January 21.—No. 11,538.

BEADON, George, and SMITH, Andrew.—" Improvements " in warping or hauling vessels, which improvements are also " applicable to moving other bodies."

One of the improvements consists in a method of transferring tug boats and barges from one level of canal to another level. Between the two levels of the canal, a bank is thrown up, which may bė cased with brick. An inclined railway reaches from the bottom of the lower portion of the canal to the bottom of the upper portion. A wheeled carriage runs on the railway and forms a cradle for the tug boat. The warping rope being secured at its ends, in any convenient place, it is connected to the warping wheel of the tug boat, " and the steam or other motive power being applied to the " wheel, the boat with its cradle will be hauled on to the " higher level." Instead of rails, pulleys may be mounted in suitable bearings in the road, and a cradle without wheels, forming a kind of sledge, may be employed. "When the tug " boat has attained the higher elevation, and has floated into " the canal above, it may, by means of a supplementary " warping rope attached successively to each one of its train " of boats or barges, haul them up over the embankment, the " warping wheel of the tug boat acting in this case as an " ordinary windlass. The tug boat with its hauling machinery " may, if thought necessary, be secured on the verge of the " incline, by breast-fasts and moorings, leaving space for each " boat in succession to be hauled into the upper part of the " canal. After each boat of the train is raised, the tug boat " warps ahead, and takes the train in tow, when it proceeds " as before to the next incline."

[Printed, 2s. 8d. Drawings. *See* London Journal (*Newton's*), vol. 31 (*conjoined series*), p. 157; Patent Journal, vol. 3, p. 238; and Engineers' and Architects' Journal, vol. 10, p. 291.]

A.D. 1847, March 25.—No. 11,640.

BRUCE, William.—" Improvements in constructing piers, " breakwaters, and other submarine works of stone."

The form of the stone for these works is that of a " hexagonal " columnar shaft ;" if of the form of more than one shaft, it is divisible into regular hexagonal columnar shafts. Each top and each base of the shafts to have a central cavity, to be filled with concrete and thus prevent the stone from having horizontal motion when in position.

The principal features of the invention are :—

1st. Building the above-mentioned structure with stones of the form described.

2nd. The method of working by machinery under water in connection with the said stones. A platform is raised on piles, the piles being placed so as to act as guides (or to support guide rods) for the placing of the stones. There are also travelling frames jack screws and cranes to lower the stones properly.

3rd. A rack and pinion arrangement has bolts that shoot out and in with smooth-sided surfaces. This plan prevents the mud from clogging the teeth. This arrangement is used to move the jack screws.

4th. A grab is used in connection with the other parts of the machine. Apparently, a ring is allowed to slip down a pair of spring limbs ; the limbs are thus forced together and take hold of the stone.

5th. This columnar way of building permits the courses to subside equally and vertically on insecure foundations.

6th. The upper part of the sea wall or other structure may be built of the said stones. The plane of the axes of the shafts of one course may form an angle of sixty degrees with the plane of the axes of the shafts of the succeeding course.

[Printed, 2s. 2d. Drawings. *See* Mechanics' Magazine, vol. 49, p. 97.]

A.D. 1847, July 3.—No. 11,777.

MITCHELL, Alexander.—" A dock of improved construc- " tion, to facilitate the repairing, building, or retaining of " ships and other floating vessels ;" " certain parts employed " in the construction of the said dock " " are also applicable " to other purposes."

[For *Specification, see* Original Patent, No. 6446, dated 4th July, 1833 ; this *document is a prolongation* of No. 6446.]

A.D. 1847, October 7.—No. 11,884.

NYE, Joseph.—"Improvements in machinery for driving "piles, and raising earth and fluids."

[No Specification enrolled.]

A.D. 1848, July 3.—No. 12,199.

BEARDMORE, Nathaniel.—"Improvements in founding and "constructing walls, piers, and breakwaters, parts of which "improvements are applicable to other structures."

A caisson is made, and is caused to float, with a portion of the structure built therein, to the spot where the wall, &c. is to be placed. The said caisson and its contents constitute a part of the permanent work.

The caisson is made of wrought-iron plates together with ribs and bulkheads. The bottom of the caisson is formed of boiler plates, rivetted together, and is connected with vertical plates by means of angle irons. The upper part of the vertical plates has a second set of angle irons which together form a ledge to project from each side, "by which cells are formed "to be afterwards filled in with concrete" or other solid filling. The sides and water-tight transverse bulk heads are formed of boiler plates rivetted, and they are strengthened by ribs and braced together to form one combined structure. A caisson is shown in the drawings with a bottom and double sides.

Another part of this invention consists "in applying arrange-"ments of plates, and filling in of the cells or spaces formed "by them, similar to those already described for the bottom of "the caisson, to the construction of flooring, such as floors of "warehouses or other buildings, and the bottoms of locks, "and other cases where great strength may be required."

[Printed, 1s. Drawing. *See* London Journal (*Newton's*), vol. 34 (*conjoined series*), p. 73; Mechanics' Magazine, vol. 50, p. 22; Artizan, vol. 7, p. 131; and Patent Journal, vol. 6, p. 135.]

A.D. 1849, January 27.—No. 12,443.

GOUGY, Pierre Frederick.—"Improvements in apparatus "and machinery for lifting and moving heavy bodies, and for "raising and displacing fluids."

This invention consists of nine improvements; only the first and fourth improvements can be noticed here.

1st improvement.—Apparatus for repairing ships.—A floating dry dock is placed in a basin "in which there is always " sufficient depth of water to float the ships on which it is " desired to operate." "When the level of the water in the " basin is higher than that of the outer harbour from the ebb " of the tide," the dock is emptied by means of a syphon. The dock has ballast suitably placed, together with "balloons," to regulate the immersion of the dock.

In another apparatus a flexible pipe, connected to the lower port of the dry dock is joined, above the level of the water to another flexible pipe that passes through the wall of the basin into the harbour. These pipes are then allowed to fall down, and thereby to permit the water to pass out from the dock into the harbour.

Another floating dry rock is emptied without recourse to the fall of the tide. Air is compressed into a vessel at the bottom of the dock, thereby forcing out the water therefrom. On opening an upper valve in the said vessel, the water flows out of the dock into it.

4th improvement.—The application of atmospheric pressure in combination with the action of the tides to empty dry docks. —The drawings show a harbour in connection with inner basins in which are dry docks. Each dock has its solid bottom level with the low water mark of the harbour. Syphons communicate with the dock and with the harbour, and these are made ready for action either by exhausting the air therefrom or filling them with water.

[Printed, 1*s.* 8*d.* Drawings. *See* Mechanics' Magazine, vol. 51, p. 141; and Patent Journal, vol. 7, p. 216.]

A.D. 1849, March 14.—No. 12,514.

CLARKE, THOMAS, and MOTLEY, THOMAS.—"Improvements " in obtaining and applying motive power; also, improve- " ments in railroads and other roads, and in supporting pres- " sure, resisting strain, and protecting against fire."

One example of the "improvements in applying the motive " power obtainable from the pressure of the atmosphere of " steam or compressed air or of water" is given in a pile-driving engine.

In a pile-driving engine worked by a vacuum, a vacuum *cylinder is fixed to* the frame, and is closed at bottom but open

at top; the said cylinder has an air-tight piston and self-acting slide gear. The chain is attached at one end to the weight; it then passes over the pulley on the top of the machine, under a pulley that is mounted on the top of the piston, over a fixed pulley, and under the bottom of the frame to the head of the pile, to which it is affixed. When the weight is down on the pile head and the piston at the top of the cylinder, communication is opened with the air pump, and the piston descends, raising the weight. The valves reverse themselves and admit air under the piston thus allowing the ram to fall, and a continuous action is kept up. The distance between the pile head and the face of the weight is always the same.

In a steam pile-driving engine, the steam acts upon the top of the piston of a vertical steam cylinder, and by means of pulleys and chains raises the weight. The piston moves through one-fourth the traverse of the weight. In another engine the steam cylinder is horizontal. In the valve gear to these engines two pistons are fixed to the same rod, and a three-way cock admits the steam under the larger piston valve; this method allows the exhaust steam to escape rapidly into the atmosphere.

[Printed, 4s. Drawings. *See* Mechanics' Magazine, vol. 51, p. 282; and Patent Journal, vol. 8, p. 31.]

A.D. 1849, April 26.—No. 12,584.

THOMPSON, Thomas Harcourt.—"Improvements in apparatus for preventing the rise of effluvium from drains, "sewers, cesspools, and other places, and in apparatus and "machinery for regulating the levels of waters in rivers, "reservoirs, and canals."

Only the third part of this invention can be treated of in this place. This relates to "the construction of apparatus "and machinery for regulating the flow of water in rivers, "canals, and reservoirs." Between two embankments are two cylinders, each containing a piston float. Rods passing upwards from each piston, carry at their upper ends friction wheels, one to each piston rod, and on the friction wheels a cross bar rests. The cross bar supports a sluice gate at its middle. When water is admitted under the two pistons, they rise up and carry with them the cross beam and sluice gate. The space which the sluice gate covers is thereby gradually

closed up, and the water on either side is kept to a regulated level, according to the rise and fall of the top edge of the sluice gate. Thus, by means of this apparatus, when a certain quantity of water has been allowed to pass from one side of the apparatus to the other, or from one place to another, the supply or flow of water is stopped.

[Printed, 1s. 4d. Drawings. *See* Mechanics' Magazine, vol. 51, p. 550; and Patent Journal, vol. 8, p. 150.]

A.D. 1849, June 5.—No. 12,630.

SMITH, WILLIAM HENRY.—"Improvements in breakwaters, " beacons, and moorings, parts of which are applicable to " other purposes."

1st. Forming breakwaters of open frames or of solid walls " constructed so as to be capable of moving upon pivots or " fulcra fixed in the bed of the sea, and combined with braces " of wood or other material extending from the upper part of " the said frames or walls to ground moorings, such braces " being rendered mechanically elastic by means of weights " attached thereto in or about the centre." The ends of the braces to which the weights are attached are formed by making longitudinal and radiating saw cuts in the ends of the logs and inserting in the sprung open end the wedge that carries the eye of the brace; the wood is then compressed and the metal ring is driven on hot, and shrinks into its place. The above-mentioned framing may be panelled with slate. The portions of the breakwaters may be in a continuous line, and a gangway constructed on the upper part of the frames.

2nd. Constructing beacons or lighthouses resting upon standards that pivot on a base fixed in the bed of the sea; these standards are rendered elastic by combination with a central weight and braces or moorings. The central weight is capable of motion, for it is connected to the braces by chains. The framing may be panelled with slate.

3rd. The construction of moorings, consisting of braces rendered mechanically elastic by means of weights suspended from links; the link is situated between the two fixed extremities of the brace. An iron pile has a barbed and jointed T end, which on being drawn upwards assumes the line of *greatest bearing* and resistance. A pile is shown, in which,

by rotation, the barbed end becomes vertical; the pile can then be drawn.

[Printed, 1*s*. 4*d*. Drawings. *See* Mechanics' Magazine, vol. 51, p. 550; and Patent Journal, vol. 8, p. 150.]

A.D. 1849, June 5.—No. 12,638.

MILLER, DANIEL.—" Improvements in the mode of drawing " ships up an inclined plane out of water."

This invention consists in the application "of a hydrostatic " cylinder fitted with a moveable ram, or with a moveable " piston and provided with injecting pumps worked by steam " or other power for forcing water into such cylinder, so " as to move the ram or piston with forcible motion by " way of a motive force for drawing ships up an inclined " plane out of water, in the mode commonly known as " Morton's Patent Slip" (See Specification, No. 4352, of the year 1819). The requisite backward or returning motion of the ram or piston is produced, when required, " either by a roller winding up a rope or chain to draw the " ram or piston backward, or by injecting or pumping water " into such cylinder to act against the front or uppermost side " of the piston and move it backwards, or by withdrawing or " pumping out from the cylinder the water that has been " previously injected into it for producing the forward motion " of the ram or piston, in order that (by so withdrawing " water) the pressure of the atmosphere may become operative " to produce the backward motion of the ram or piston, or by " the descending force of a reacting weight, which has been " previously raised up during the forward motion of the ram " or piston."

[Printed, 1*s*. 2*d*. Drawing. *See* Mechanics' Magazine, vol. 51, p. 547; Practical Mechanics' Journal, vol. 2, p. 239; Artizan, vol. 8, p. 45; also vol. 10, pp. 45 and 253; and Patent Journal, vol. 8, p. 149.]

A.D. 1849, November 6.—No. 12,834.

NEWTON, WILLIAM EDWARD. — (*A communication.*)—" Improvements in machinery for dressing, shaping, cutting, " and drilling or boring rocks or stone, part of which im- " provements are, with certain modifications, applicable to " machinery or apparatus for driving piles."

The pile-driving machine comprised in this invention is *described by* means of a machine for boring rocks, which is

said, with very little modification, to be capable of being used as a pile-driving machine. Friction wheels (on the axis which is driven by steam or other power) are in contact with other friction wheels or drums mounted on the shaft that carries the rope attached to the monkey or weight. The axes of the latter drums are mounted upon slings, and the slings are jointed to the shorter end of a foot lever. This arrangement enables the friction drums to be brought into contact for raising the weight as often as may be required.

The jaws of the above machine are "similar in construction "to those ordinarily used in pile engines and such like "machines for raising and detaching the monkey or weight."

In the pile-driving machine, the weight of the jaws and of the monkey tend to make it self-acting.

[Printed, 1s. 2d. Drawing. *See* London Journal (*Newton's*), vol. 37 (*conjoined series*), p. 243; Mechanics' Magazine, vol. 52, p. 379; and Patent Journal, vol. 9, p. 53.]

A.D. 1850, January 17.—No. 12,931.

NYE, JOSEPH.—"Improvements in hydraulic machinery; "parts of which improvements are applicable to steam en-"gines and machinery for driving piles."

[No Specification enrolled.]

A.D. 1850, February 12.—No. 12,968.

MACINTOSH, JOHN.—"Improvements in obtaining power "in the floating of bodies, and in conveying fluids."

The second part of the invention is the only portion which can be set forth in this place; it relates to forming harbours and constructing floating bridges.

Harbours are formed "by employing sheets of matter suffi-"ciently buoyant to float on the surface of the water, such "sheets of matter being flexible and more or less yielding "to the waves." Wire or cord net work may be rendered buoyant by casting thereon a thickness of tar combined with sawdust and fibrous matter. Gutta percha and india-rubber, with fibrous and other matters, may be used for making the said sheets; or sheets of strong canvas rendered buoyant may be used. Wooden spars or metal tubes may be used at the edges of the said sheets. These sheets are placed "on the sea

" in such directions as may be required to form the desired " harbour;" they are retained in position by anchors and chains.

A floating bridge is constructed by means of a series of planks, made fast (by cords) to a surface formed of a waterproof fabric. The sides of the fabric are made with hollow air-tight chambers to give buoyancy to the whole. When this flexible bridge is not in use it may be rolled up round a spindle. When it is required to use the bridge, it is brought to the water's edge, air is forced into the said chambers, through a stop-cock, and the coil is unwound by pressure. Buoyancy may be given by filling the chambers with cork, but air vessels of macintosh cloth have been found to answer well.

[Printed, 1*s.* 8*d.* Drawings. *See* Mechanics' Magazine, vol. 53, p. 138; and Patent Journal, vol. 9, p. 219.]

A.D. 1850, August 17.—No. 13,226.

WILD, CHARLES HEARD.—" Improvements in certain structures for retaining water."

1st. " Constructing a graving dock with a lining of iron " plates tied down."

2nd. " A floating caisson dock, with a cellular wrought-iron " caisson, constructed and arranged in such a manner as to " preserve its parallelism as it rises and falls."

3rd. " Constructing dock walls and similar structures of " iron piles, with inverts of brickwork, or masonry, or " iron between them, the piles being kept in their places by " ties."

4th. " Constructing the folding gates of locks and other " structures for retaining water of wrought-iron plates, " arranged in a cellular form."

5th. " Constructing the folding gates of locks and other " structures for retaining water with an air-tight compart- " ment at the bottom, and admitting the water to flow freely " in and out above this compartment, so that the weight of " the gate may be equally or nearly equally balanced at dif- " ferent heights of the water."

6th. " Making the joint at the heel of gates for retaining " *water.*"—In lieu of forming the heel post, and the masonry *in which it works* of a truly cylindrical form, a flat strip of wood

is attached to the heel post, and the masonry is prepared with a corresponding narrow flat surface with which the wood comes in contact when the gates are closed; a similar piece of wood is attached to one or both gates, at the point at which they come in contact.

[Printed, 1s. 8d. Drawings. *See* Mechanics' Magazine, vol. 54, p. 158; Patent Journal, vol. 10, p. 280; and Engineers' and Architects' Journal, vol. 14, p. 210.]

A.D. 1850, September 5.—No. 13,244.

WATT, WILLIAM.—"Improvements applicable to inland navi-" gation, which improvements, or parts thereof, are also " applicable generally to raising, lowering, or transporting " heavy bodies."

The main features of this invention, that may be set forth in this series of Abridgments, are:—

The system of varying fluid levels in elevating or lowering chambers employed for the transport of floating bodies, by the displacement of a fluid contained in a communicating chamber through the agency of compressed air or by means of exhaustion.

The use of a closed chamber in communication with canal lock chambers.

The use of compressed air, or of exhaustion to vary the water level in the lock chambers of canals.

The system of working locks by the displacement of water contained in receivers in communication with the lock chambers.

The system of working locks by placing two or more receivers in communication, to allow the compressed air in one to partially elevate the water level in the other.

The use of compressed air or of exhaustion to work graving or other docks.

"The system or mode of transferring vessels or floating " bodies to and from wet docks at various levels of the water " outside such docks, by the displacement of the water in the " entrance chamber or chambers."

[Printed, 1s. 10d. Drawings. *See* Mechanics' Magazine, vol. 54, p. 219; Practical Mechanics' Journal, vol. 3, p. 279, and vol. 4, p. 78; Engineers' and Architects' Journal, vol. 14, p. 179; Artizan, vol. 9, p. 125; and Patent Journal, vol. 11, p. 4.]

chain that passes over a topmost pulley; the other end of the chain is fixed to the uppermost axis or stud of the system of levers. The cross levers are retained correctly in their places by two vertical guide plates, "some of the axes of the cross " levers passing between such guide plates; and they are " prevented coming away by such axes having enlarged heads, " which cannot pass between the guide plates." The lower of the cross levers are extended, and they are connected to a rack bar (that moves vertically), by means of two links that vibrate upon a pin joint at the top of the said rack. The fulcra from which the cross levers are worked, by means of the rack and links, are in the same vertical line as the cross levers and are fixed to the base framing of the machine. Two other links from the fulcra are jointed to the extremities of the extended cross levers. Motion is communicated to the rack, by means of a cranked axis or handle and a pinion on the said axis. The lazy-tongs arrangement is in its contracted position when the monkey is at its highest elevation.

[Printed, 1*s.* 8*d.* Drawings. *See* Mechanics' Magazine, vol. 54, p. 413.]

A.D. 1850, November 19.—No. 13,356.

DE TOLSTOY, PAUL.—(*A communication.*)—"Improvements " in dredging machines."

[No Specification enrolled.]

A.D. 1851, February 10.—No. 13,500.

NORRIS, RICHARD STUART.—"Improvements in the construc- " tion of the permanent way of railways, bridges, locks, and " other erections wholly or in part constructed of metal, also " improvements in brakes for railway carriages."

These improvements relate, firstly, "to a method of joining " together, fastening or supporting the bars of railways, " various parts of iron bridges, locks, and other erections, and " consist in effecting such object by casting molten iron, or " other suitable metal, upon or about the said rails or other " parts intended to be joined, fastened, or supported."

The drawings show a mode of applying these improvements to the construction of the foot box of a lock. The foot step having been adjusted to its proper position within the box, molten iron, or other suitable metal, is poured into the surrounding space, so as to effect a perfect union of the two.

These improvements relate, secondly, to the employment of a portable cupola furnace "for the purpose of casting portions of "railways, bridges, locks, or other erections at or about the "situation where such castings are intended to be used."

[Printed, 10*d*. Drawings. *See* London Journal (*Newton's*), vol. 42 (*conjoined series*), p. 4; Mechanics' Magazine, vol. 55, p. 139; Artizan, vol. p. 239; and Patent Journal, vol. 11, p. 245.]

A.D. 1851, July 22.—No. 13,698.

DUNDONALD, THOMAS Earl of. — "Improvements in the "construction and manufacture of sewers, drains, waterways, "pipes, reservoirs, and receptacles for liquids or solids, and "for the making of columns, pillars, capitals, pedestals, bases, "and other useful and ornamental objects from a substance "never before employed for such manufactures."

The said substance is the "bitumen, petrolium, or natural "pitch of Trinidad and of the British North American "colonies."

One of the uses of the crude and less pure material is to construct submerged foundations for submerged works, by combining it with gravel, stones, or other like materials, so as to constitute a bituminous concrete, and then pouring it, in a boiling state, "into the water over the site of the intended "foundation." The drawings represent a lighthouse built upon a block formed by pouring successive portions of the crude bitumen on the said gravel, &c., the pouring being continued so that the last portions firmly unite to those previously immersed.

This "method of forming submerged foundations is equally "adapted to their construction on sand banks or shoals in the "sea, where extended surface, solidity, and strength are "essential." Such crude bitumen, or bituminous concrete may be used in like manner to support decayed or undermined piers, pillars, or walls, "and for other purposes such as arresting and consolidating rolling gravel or shifting sand (often "productive of great mischief), and for forming embankments."

The beds of streams may be made water-tight by a coating of bitumen.

[Printed, 10*d*. Drawing. *See* Repertory of Arts, vol. 19 (enlarged series), p. 289; London Journal (*Newton's*), vol. 40 (conjoined series), p. 186; and Mechanics' Magazine, vol. 56, p 98.]

A.D. 1851, October 17.—No. 13,779.

ROBERTS, RICHARD.—" Improvements in machinery or ap-" paratus for regulating and measuring the flow of fluids; " also for pumping, forcing, agitating, and evaporating fluids; " and for obtaining motive power from fluids."

This invention is comprised under twenty separate heads, but the only portion of the invention which refers to harbours, docks, and canals is the nineteenth improvement.

According to the nineteenth head of the invention, the power from a column of water is made to act on a piston so as to open and close "lock and dock gates, swing bridges, and " other machinery of the like nature." The piston and valve arrangement employed in the first improvement is employed to illustrate the method of working out the nineteenth part of the invention. In the said first improvement (which is for a fluid meter) the pressure of the head or column of water is admitted to a piston in a cylinder by means of suitably-placed tubes in connection with two three-way cocks that are worked by the same handle. The piston rod also carries a conical valve; the ascent of the piston raises the valve and contracts the passage for the water. "The principal advantage derived " from this arrangement of machinery is, that the pressure of " the water in the main pipe" "is made to raise or lower the " regulating valve by the attendant exerting only the power " required for reversing the cocks."

[Printed, 3*s*. Drawings. *See* Mechanics' Magazine, vol. 56, pp. 338; and Engineers' and Architects' Journal, vol. 15. p. 262.]

A.D. 1852, March 24.—No. 14,042.

COLE, WILLIAM, and HOLT, ALFRED.—" An improved method " of preventing and removing the deposit of sand, mud, or " silt in tidal rivers in certain cases, and also in harbours, " docks, basins, guts, or other channels communicating with " the sea through tidal rivers or otherwise, the same being " applicable in certain cases to other rivers or moving " waters."

The chief feature of this invention is the preventing and removing the said deposit "by means of numerous shoots or jets " of water issuing under pressure into such deposit, or the " water containing such deposit in suspension."

The water is injected from below and is derived from a reservoir at a considerable elevation above the bed of the harbour; or, the water may be supplied under pressure by artificial means. At or below or near to the bed are placed suitable pipes, perforated so as to allow of the jets of water being applied in all directions to the deposit.

"In ordinary tidal waters it will be found desirable to lay "on the head of water at half ebb tide, and to keep it until "low water or after low water, in cases in which additional "water for carrying away the deposit so disturbed is available. "If there be no existing head of water available for the pur-"poses above described, or artificial reservoir available for such "purposes, the same object may be effected by a forcing "pump, or by retaining water under pressure as is well under-"stood. Where inland rivers meet at or nearly at right "angles, a delta of sand, mud, or silt is usually formed at a "short distance below the junction; such delta may be re-"moved and prevented from forming by means of water "conveyed to or against it, as above described."

[Printed, 4*d.* No Drawings. *See* Repertory of Arts, vol. 20 (*enlarged series*), p. 245; London Journal (*Newton's*), vol. 41 (*conjoined series*), p. 278; and Mechanics' Magazine, vol. 57, p. 279.]

A.D. 1852, May 17.—No. 14,127.

NEWTON, WILLIAM EDWARD.—(*A communication.*)—"Im-"provements in the construction of docks, basins, railways, "and apparatus connected therewith, for raising or removing "vessels or ships out of the water or on to dry land for the "purpose of preserving or repairing the same."

This invention consists principally "in forming a floating "dock of a series of separate sections which may be con-"nected together in any desired number to suit the size or "length of the ship or vessel to be raised, and which sections "can be disconnected at pleasure." Each section consists of a hollow water-tight vessel, provided with valves and pumps, whereby water may be admitted into the interior and pumped out therefrom when required. Another hollow vessel is fitted at each end of these separate sections, arranged so that it may move vertically up and down in a frame; these movable vessels *steady the dock* while rising. In the pumping arrangement,

the shafts of each section being connected by universal joints, the water can be simultaneously exhausted or pumped out from the several sections.

The basins, railways and apparatus connected therewith are constructed so as to facilitate "the removal of the ship or other "vessel from the floating dock on to the fixed ways on which "the ship or vessel may remain for the purpose of examina-"tion or repair."

[Printed, 1*s.* 4*d.* Drawings. *See* Mechanics' Magazine, vol. 57, p. 435.]

A.D. 1852, October 7.—No. 14,315.

ANDREWS, Solomon.—"Improvements in machinery for "cutting, punching, stamping, forging, and bending metals "and other substances, which are also applicable to the "driving of piles and other similar purposes, and to crushing "and pulverising ores and other hard substances."

As applied to the driving of piles, this machine consists of a heavy base block of metal to which are firmly secured two vertical standards between which is a clutch box arrangement and the hammer or weight. The driving shaft, on which is the clutch box, is mounted on a cross-head at the top of the uprights. A forked lever and spring, in conjunction with a link, are employed to throw the clutch out of gear. The operation of a sliding bolt, by means of a treadle, liberates the weight. On the driving shaft is a cord wheel; the cord of this wheel is attached at one end to the weight, and at the other end to the wheel itself.

Motion being communicated to the driving shaft, and the clutch being in gear by means of the spring lever, the weight is raised. The treadle being then depressed, the sliding bolt is liberated and the clutch thrown out of gear, thus allowing the weight to fall. The falling of the weight strikes a rod which liberates the spring of the spring lever and throws the clutch into gear; the weight is thereby again instantaneously raised.

[Printed, 10*d.* Drawing.]

PATENT LAW AMENDMENT ACT, 1852.

1852.

A.D. 1852, October 5.—No. 222.

BÉRARD, Aristide Balthazard. — "Improvements in the " constructions of jetties, breakwaters, and docks, and other " hydraulic constructions."

This invention consists in constructing the said works, or portions thereof, "in single blocks formed on the spot, or of " several blocks, such blocks being in either case formed of " an assemblage of bricks or lumps of clay arranged in deter- " minate forms, and united by partial fusion or vitrification."

According to one method of proceeding, a grate is formed of three or four layers of bricks, which also form the base of the block. This base is surrounded by a wall of bricks, and upon it is placed another layer of bricks arranged rather more openly than the previous layers; the spaces between these bricks are filled with burning coals. Dried bricks and coals are then disposed symmetrically, in layers, in the shape desired, as the heat rises and the enclosing wall is raised. The whole block is thus gradually vitrified and the interstices are filled up as the work proceeds.

According to another method of proceeding, iron frames may enclose the faces of the block, very thin layers of coal being placed between the bricks, and flues being constructed in the block. The shrinkage of this block takes place chiefly in height.

In building a breakwater, the lower part may be made of blocks thrown into the sea, and the upper part "by arranging " the courses of bricks and fuel on the spot, and baking and " vitrifying the whole in its place so as to produce one con- " tinuous piece or block of great strength and durability."

[Printed, 6*d*. No Drawings.]

A.D. 1852, October 20.—No. 458.

DONALDSON, Peter Evans.—"Improvements in dams, "locks, and lock gates."

These works are constructed chiefly of wrought iron. The dam is hollow, and is capable of rising or falling between upright guides or towers. The locks are constructed with hollow sides and bottoms, and are filled up; they have "recesses "at right angles to the sides of the lock, for the purpose of "enabling the lock gate to be drawn or slid back into them "when necessary to open a passage through the lock." The lock gates are constructed with an air chamber at bottom, so as to make them sufficiently buoyant to be easily moved into and out of the recesses.

To allow the dam to rise and fall, guide blocks, suspending chains, and adjusting links are employed. The guide blocks on the dam work in the grooves of guide pieces, the upper portions of which are formed into racks to allow of the dam being fixed at any required height by means of keys. The dam may be floated to its place and then water may be allowed to enter it until it has sunk to the bottom of the river.

The lock gate has valves, and traverses into its recess and out of it on a railway.

[Printed, 8*d*. Drawing.]

A.D. 1852, October 26.—No. 526.

NASMYTH, James.—"An improved mode of utilizing running "waters."

In carrying out this invention, the inventor diverts the waters, or a portion of the waters, of a river or stream, and carries the same on for a given distance, at or near about a dead level; the acquired height of the water can be used for supplying towns and villages, and for other purposes, "a "transversal canal being provided for returning the water "when required into its natural channel."

In following the course of a lengthy river, in order to obtain a height and depth of water serviceable for the purposes to which it is to be applied, the whole length of the river is divided into as many sectional reservoirs as may be advantageous, and they are connected with the river and with one another by transversal canals. The reservoirs are made

alternately at opposite sides of the river. The transversal canals are provided with gates for shutting off or opening a communication with the river.

"As these reservoirs may be constructed wherever required, "and alternately on opposite sides of a river or stream, by "being connected with one another and with the river by "transversal canals and locks, they may be employed for the "transport of passengers and merchandise" as well as for other purposes.

[Printed, 6*d*. Drawing.]

A.D. 1852, October 28.—No. 557.

MALLET, ROBERT.—"Improvements in fire-proof and other "buildings and structures."

This invention consists in constructing the said structures by the application of plates of wrought iron or other suitable material, bent or otherwise figured into a peculiar convex and concave form; these plates are called by the inventor "buckled "plates." Whatever may be the contour of the plate, both sections taken at right angles to each other through the centre of the plate, present a convex line of surface on one side of the plate and a concave line on the opposite side.

These plates may be combined face to face with or without an intermediate frame to form cellular wrought-iron lock gates.

In applying these plates to the construction of dock walls, retaining walls, wharf walls, sheet piling and similar structures, they are bolted or rivetted to hollow triangular piles made of wrought-iron plates rivetted together and driven into the ground. The piles may be strengthened by land ties carried back into the earth and fixed to other piles.

In iron lighthouses of a polygonal form, each face is made of a series of buckled plates placed one above another and firmly united at the corners by angle irons or T irons. In the interior of the parallel or tapering hollow tower thus produced, floors are constructed at various heights, each floor being made of a single buckled plate, with openings for staircase, &c. Another plan is to carry a central column up the tower and to form the floors by means of triangular buckled plates.

[Printed, 10d. Drawing.]

A.D. 1852, November 5.—No. 656.

DUNDONALD, Earl of. — "Improving bituminous sub-" stances, thereby rendering them available for purposes" to which they never heretofore have been successfully" applied."

According to this invention the natural bitumen of Trinidad and New Brunswick is made elastic by the influence of gentle heat in combination with the action of solvents.

Similar means, in conjunction with different solvents, may be used to remedy the hardness and brittleness of factitious bitumens, such as gas pitch.

One part of the invention consists in protecting submerged foundations and similar hydraulic works by dipping heated stones in a liquid mixture containing gas pitch and resinous substances, and then dropping them around the structure to be protected. This part of the invention can also be applied to the construction of submerged foundations.

Another portion of the invention consists in "the manu-" facture of bituminous cemented bottoms for caisoons, the" conglomerating of shingle or sand on beaches or in rivers," and the use of such adhesive bituminous compounds to" arrest rolling gravel or shifting substances, which now" frequently block up the entrance of ports and rivers."

Other portions of this invention relate to the joining of pipes, coating vessels, and preserving vegetable gums and resins.

[Printed, 4*d*. No Drawings.]

A.D. 1852, November 23.—No. 822.

EADE, GEORGE.—(*Provisional protection only.*)— "A surface" and subaqueous floating breakwater."

"It is composed of buoys, some floating on the surface," others below the surface, of the water, so arranged and held" together as to have the effect of a reef, to the leeward of" which vessels may ride at anchor in safety.

"Some of these surface bouys are held by chains to anchors;" and, attached to these anchor chains, at three to seven feet" below the surface buoys, are subaqueous bouys. The sur-" face buoys are attached to each other by chains, and to the" subaqueous bouys diagonally."

"Halfway between the anchor surface buoys are attached "other surface bouys, with chains descending from them to "the crossings of the diagonal chains, at which point they "are secured; and here subaqueous bouys may be placed."

[Printed, 6d. Drawing.]

A.D. 1852, November 26.—No. 871.

TAYLOR, James. — "Improvements in and applicable to "floating graving docks, for repairing and building ships."

These improvements consist in methods of "construction "and arrangement of floating graving docks composed of "iron, and formed in water-tight compartments with the "means of easy control and regulation of the floating power "of the structure, so as to admit of the docking and undock-"ing of ships or vessels," independently of the rise and fall of the tides.

According to one plan the water may be discharged from the compartments and its height regulated by means of a steam engine and pumps at the head of the dock. The docks are closed at the stern by means of iron gates or a caisson worked by crab winches and chains. To the body of the dock on each side are adapted hollow chambers with partitions in them, into which chambers "the water may pass from the "body of the dock through valves worked from the upper "part of the same."

The object of this invention may also be accomplished by "raising upon ship lifts or rafts hollow air-tight side walls, "thereby forming such lifts or rafts into floating graving "docks."

To take a vessel into dock, the dock is sunk to the required depth by admitting more or less water into the body of the dock or into the compartments thereof. The ship being within the dock and the gates closed, the ship is allowed to settle down upon the blocks by passing water from the body to the chambers. The pumps are then set to work, and the remaining water withdrawn from the body of the dock. "In taking "the vessel out of dock the above described mode of operation "is reversed."

[Printed, 1s. Drawings.]

1853.

A.D. 1853, January 12.—No. 88.

LAWRENCE, Frederick, and LAWRENCE, Alfred.—"Im-"provements in sluices and lock gates."

"This invention consists of arranging apparatus so that the "head of water is made to assist in opening or closing such "sluice or gate. To accomplish this object a piston or pistons "is or are connected with the sluice or gate, against which "piston or pistons the head of water acts when communica-"tion is opened with the low level, and which communication "may be regulated in its action by one or more valves. The "raising and lowering of the regulating valves, and opening "or closing of the main sluice or gate, is effected by machi-"nery so arranged that their motions follow one another as "may be required. This is accomplished by means of a "pinion (the axis of which is moveable) with racks on either "side attached to the regulating and main sluice or gate "respectively, the upward or downward motion of the pinion "producing double the motion in one or other of the racks as "may be necessary."

The drawings show this invention adapted to a sluice for a culvert where there is a head, also where there is no head of water. The application of the principle to sluices in lock gates and to open and close lock gates is also shown.

[Printed, 10*d*. Drawings.]

A.D. 1853, January 21.—No. 158.

CURTIS, William Joseph.—"Excavating or digging earth," and "carrying or delivering the soil."

The first modification of the apparatus that forms the subject matter of this invention is adapted either to excavate a canal or a cutting for a road or railroad. Picks are employed "in combination with dredging buckets or other equivalent "machinery worked by steam, working upon a traversing "frame, which frame moves or works upon a cross frame, "having a movement at right angles with the traversing "frame." There is also a combination of apparatus, of trays and buckets, or waggons or trucks, "for delivering the soil

" from the excavating machine to a distance from the machine
" itself, whether at right angles or in the direction of the
" machine."

In the fourth apparatus a dredging engine is employed in combination with soil delivering apparatus, for excavating and delivering the soil from a dock or other work. In this plan a floating indicator is used; by this means the ladder of buckets is raised or lowered according to the depth of water. Picks are used in combination with the dredging engine, either in the same or a separate vessel therefrom.

The picks have guides, lifting cams, and loose lifting blocks. Each lifting block takes into a ratchet on the pick. The pick is left "free to descend any requisite depth," nothwithstanding the rolling or pitching, or rising or falling of the vessel.

[Printed, 2s. 8d. Drawings.]

A.D. 1853, January 31.—No. 247.

PERKS, SAMUEL.—" Improvements in the mode of construct-
" ing certain works applicable to aqueducts, viaducts, rail-
" ways, canals, rivers, docks, harbours, lighthouses, break-
" waters, reservoirs, tunnels, sea walls, embankments, sub-
" marine foundations, and other useful purposes."

The parts of the invention which can be treated of in this series of Abridgments are as follows:—

In the third part of the invention, hollow iron caissons are substituted for ordinary stone work in arches for bridges.

The sixth part of the invention refers to the formation of foundations for the construction of sea walls, docks, harbours, breakwaters, and reservoirs. This is accomplished "by em-
" ploying a series of chain work (galvanized preferred) as the
" basis of the principle for the purpose of interlacing and
" connecting the whole mass together, and in some cases
" using drift stays where required." To establish firm foundations upon soft, loose earths in order to reclaim lands from the encroachments of the sea, rude blocks of granite attached to chains are cast overboard so that the chains are on the stretch, and great numbers of these being crossed in different directions are said to form a boundary which the sea cannot remove, and which may form the basis of a superstructure such as a lighthouse, or any of the structures named above.

For reservoirs, the embankments may be connected together by a series of chains, blocks, and drift stays. For dock walls on bad foundations, the series of chains connecting the stones may have their ends carried inland and there firmly fixed, other chains of shorter lengths intersecting these, so as with concrete to obtain a substantial bed or foundation.

[Printed, 8*d*. No Drawings.]

A.D. 1853, February 1.—No. 270.

CLARKSON, Thomas Charles.—(*Provisional protection only.*) —"Improvements in giving elasticity to certain structures "and parts thereof."

"In stone I cut or otherwise make a hole of sufficient size "to admit of my elastic material and chair for a railway "sleeper, which removes the present wear & tear, and the "injurious effect from vibration. In my concrete or cement "sleeper I mould it to the required shape and size, at the "same time leaving a hole for the reception of my elastic bed "& chair;" the flang on my chair prevents the possibility "of its moveing from its proper possition. This sleeper will "greatly economise the present heavy expenditure, also pre-"vent the danger now existing on the present plan of the "rails. The elastic material in combination for sea walls, "fortification, common roadways, and beds for iron girders "will remove the present evil, which vibration and force now "so ruinously acts.

"What I wish to be understood to claim is, the moulding "concrete or stone into any shape or form to admit of my "elastic material or wood, so as to prevent the iron rails & "chair comming in contact with any ridged medium, &c."

The "elastic material" "is a combination of alternate "layers of sheet cork, wood, canvas, &c. all adhered by ad-"hesive substances."

One of the figures in the drawing represents "an elastic "construction of stone or concrete for buildings such as sea "walls," &c. The elastic material is placed between every layer of stone or concrete. In the stones there are bolts with screws to compress the elastic material.

[*Printed, 6d.* Drawing.]

A.D. 1853, May 16.—No. 1210.

TIZARD, WILLIAM LITTELL.—(*Provisional protection only.*)—
" Improvements in dredging machines."

This invention "consists in substituting for the ordinary " frame carrying the dredging buckets a compound or sliding " bar, which admits of the chain of buckets being lengthened, " and so penetrating deeper into the ground when re- " quisite."

The inventor forms "the lower part of this bar of the same " breadth as the buckets, which are thus enabled to work into " a narrow opening when required."

The inventor makes "the sides and bottoms of the buckets " solid, that is to say, without holes or apertures."

[Printed, 4*d*. No Drawings.]

A.D. 1853, July 7.—No. 1622.

VAUX, CHRISTOPHER.—(*Provisional protection only.*)—"Im- " provements in floating breakwaters."

This invention "consists in abating the injury from the " shock of the waves of the sea by reducing them to broken " water instead of exposing to them fixed resistance."

Yielding bodies, such as timber frames, hollow cylinders, or caissons are employed. Cast-iron blocks are bolted to the shank of the anchor to keep the fluke firmly in the ground. For a mooring, instead of a chain, a wrought-iron bar or plate is surrounded with timber bolted or otherwise fastened thereto; these bars may be connected end to end. To prevent a sudden strain from coming on the moorings, hollow cylinders or caissons are fixed "upon the pieces of timber inclosing " the rod or plate of iron at about every 20 fathoms"; this keeps the moorings in a festoon form. To preserve the floating power of these cylinders or caissons in the event of a rupture, they may be filled "with numerous small vessels or cells, " made either of very thin sheets of iron or copper, so that if " any of them should be damaged the remainder would retain " the floating power of the caisson."

[Printed, 4*d*. No Drawings.]

A.D. 1853, August 4.—No. 1820.

HICKSON, William.—"Improvements in canal and river "navigation, and in vessels to be used in such navigation, "and in the mode of propelling the same."

The portion of the invention that relates to locks is as follows:—At the bottom of the lock, "a barge large enough "to contain one or two canal boats, as the case may be, is "sunk by being filled with water by means of a self-acting "telescopic syphon. When the canal boats are admitted "into this lock from the canal level the gates are closed, and "the water in the lock drawn off sufficiently to allow the "canal boats to rest on the deck (midway down the hold) of "the barge, which is however partially immersed. The "syphon is then employed to empty the barge of the water "previously admitted for the purpose of sinking the barge. "So soon as a sufficient quantity of this water has been drawn "off the barge will rise in the water left in the lock, bearing "along with it in cargo the canal boats with their cargoes, "and may then be propelled out of the lock to her destina-"tion."

According to another arrangement, two large tubes, one within the other, are fastened to the bottom of the lock pit. When in action, the upper portion of this double tube is open immediately under a fixed syphon in the bottom of the barge; it presses against the bottom of the barge round about the fixed syphon. The area of the smaller tube forms an outlet for the superfluous water from the hold of the barge. The hydraulic pressure and the large outer tube prevents the water remaining in the lock escaping at the same time through the inner tube; the inner tube is connected with the next lower lock.

A pontoon with gates may be used to tranship cargoes.

[Printed, 8*d.* Drawing.]

A.D. 1853, August 6.—No. 1838.

HUGHES, John.—"Improvements in building or forming "structures under water or below the surface of the ground."

To build the said structure, a hollow vessel or "shoe" is employed. This vessel is open at the bottom; within it the ground is excavated, or other competent means may be used to remove the sand or other materials "through which the

" shoe is to be sunk in order to arrive at the intended founda-" tion."

The top of the shoe may be either open or covered. The shoe is the same size and shape as the area of the foundation intended to be laid by its means. When the shoe has descended to its proper level, the foundation, of bricks, &c., may be formed within it, and the shoe left in its place. The building is erected upon the foundation during the time of descent of the shoe, "so that the upper part of the building may at all " times be above the surface of the water," the interior of the building being made hollow to allow the material to be removed or the building substances to be introduced. Vertical guide plates are used to keep the building in its proper position during its formation and descent.

When exhaustion or compression of air, contained in the interior of the shoe or building, is employed, a cylinder is attached to the top of the shoe, its upper end always being above the surface of the water.

The drawings show this invention adapted to the construction of pillars, which may form part of a pier; or (by prolonging the guide plates above the tops of the pillars and fitting iron plates to them), a species of coffer dam may be constructed.

[Printed, 8*d*. Drawing.]

A.D. 1853, September 1.—No. 2026.

MACINTOSH, John.—(*Letters Patent void for want of Final Specification.*)—"Improvements in breakwaters."

"My improved breakwater consists of two rigid surfaces or " rafts, the upper one of which floats on the surface, and the " lower one, to which it is firmly connected, is submerged " some distance below the surface, but is inclined to the upper " one.

"This breakwater is so moored that the waves enter between " the surfaces where they are widest apart, and issue where " they are nearest together.

" I have also found it desirable, in floating breakwaters " composed of flexible fabrics, to distend such fabrics on " frames sufficiently rigid to keep the fabric distended, but " at the same time to yield to the rise and fall of the waves.

"By these means I am enabled to moor such breakwaters "with much fewer anchors than heretofore, and also to place "lights in elevated positions, when desirable."

[Printed, 4*d.* No Drawings.]

A.D. 1853, September 29.—No. 2233.

KENNARD, THOMAS WILLIAM.—"Improvements in con- "structing piers and foundations under water."

A caisson or framing of iron has tubes or guides in a vertical or inclined position. The shafts of screw piles are inserted into the said tubes so that their screw ends project below the bottom of the caisson, and the caisson, thus furnished, is lowered down upon the spot where it is desired to construct the pier. The shafts of the screw piles are then turned round so as to screw them into the earth. When a pile has entered to a sufficient depth, a loose collar is slipped on to its top and fixed by a key; the pile is then screwed down so as to force the caisson down. In this way, when all the piles are screwed down, the caisson is caused to enter the ground as far as possible. The upper ends of the piles are then firmly secured to the caisson by keys or otherwise, and it is filled with concrete. In some cases, the water may be pumped out, and the concrete then introduced, or brickwork or masonry may be constructed within the caisson. As the caisson is sunk into the ground, additional plates may be added to its top, the superstructure may then be built upon the foundation thus made.

Ordinary piles may be employed instead of screw piles, and the caisson may be forced down by levers. "Two or more "framings or caissons may be placed side by side, and con- "nected to form a single pier or foundation."

[Printed, 8*d.* Drawing.]

A.D. 1853, December 2.—No. 2801.

CALLEN, ARTHUR WELLINGTON.—(*A communication.*)—(*Provisional protection only.*)—"An improved excavating and "dredging machine."

A floating vessel is wholly or partially decked over, and has a steam engine fixed at one end thereof, which drives a set of chain drums and the other gearing of the machine, to which

the chains that work the excavator are attached. "At the "other end of the vessel" "a crane is erected, to the end of "which the excavator is attached by the chains above men- "tioned; these chains work the excavator up or down, or "forwards or backwards."

"The excavator consists of a long beam, at the end of which "is fixed a strong iron scoop or bucket, the back end of which "opens upon hinges, so as to discharge the material excavated, "when it closes by its own weight, & when closed the end is "held secure by strong iron catches and drop bolts." The discharge of the material is accomplished by cords carried to the deck, which act upon the drop bolts. The excavator is raised or lowered by rack and pinion gear in connection with the crane. The scoop is drawn forward by the engine, which acts through a chain which passes over the end of the crane. The crane is swung round by an endless chain that passes round the edge of a circular platform at the bottom of the crane, the endless chain being in connection with the engine.

The material is delivered into barges.

[Printed, 4d. No Drawings.]

1854.

A.D. 1854, April 5.—No. 785.

SMITH, STEPHEN RANDOLL.—"Improvements in vessels and "apparatus used for raising sunken vessels and other bodies "in the water, and for lowering materials for structural "purposes in water."

"My invention, which I call the central tubular marine "lifting apparatus, consists of a floating vessel, constructed "of wood and iron, somewhat resembling the hull of a ship, "having a deck on which the principal mechanical operations "are performed, and furnished with a series of iron tubes "arranged in the central line of the deck, and passing "through the body of the vessels from the deck to the bottom, "the said tubes being used as conductors, through which "chains are worked for the purpose of lifting sunken vessels

"or other ponderous bodies, or for depositing heavy masses "of concrete or masonry to be used in the construction of "piers, harbours, breakwaters, or other erections or foundations. The tubes being in the centre of the vessel admits "of the use of any available power from the centre of the "vessel for the purposes of lifting or otherwise, without "lurching or disturbing the vertical position of the vessel and "apparatus; it also admits of the use of encircling chains "to be applied for the purpose of lifting vessels or other "ponderous bodies."

The chains or cables that may be used "for depositing heavy "masses of concrete or masonry for foundations or other sub-"marine purposes, are passed from any suitable lifting "machinery placed on the deck of the vessels," through the above-mentioned vertical iron tubes, "and are secured by "suitable arrangements of encircling chains and shackles "carried by a steam tug having suitable fittings and arrange-"ments as regards hawse pipes, nippers, &c., for the working "of the chains."

[Printed, 1s. 4d. Drawings.]

A.D. 1854, May 2.—No. 983.

WALLER, Richard.—"Improvements in valves applicable "to steam engines and other purposes, and in apparatus "connected with the same."

The portion of this invention which is applicable to the valves of reservoirs and sluices is treated of here.

The valve is covered closely with a movable valve box having arms; the box "is supported by and moves backwards "and forwards on rollers carrying the valve with it." "The "valve is pierced or opened entirely to the required dimen-"sions," "leaving such surface to be acted upon by the "pressure resulting only on the exhaust side of the valve, "which serves to keep the valve in contact with the surface "of the face plate."

The second part of these improvements "consists of two "sets of rollers, and two rollers to each set, with flexible flaps "to keep them at the proper distance asunder, so connected "that they move in the same direction, and as one is "gradually opening the port the other is closing it, by the "roller pressing down the flexible flaps, which have bars or

" ribs enclosed or fixed on the top, or by a chain made of " links, similar to the spring box of a watch, but multiplied " in the width to any dimensions required." The same results can be obtained " by substituting for the said flaps or chain " an endless band of india-rubber, or any flexible or pliable " material, so put on the rollers that as one roller covers " one part, the other will be open, and so on continuously."

[Printed, 10*d*. Drawings.]

A.D. 1854, July 18.—No. 1577.

BELLFORD, AUGUSTE EDOUARD LORADOUX.—(*A communication.*)—" A new kind of piston."

The " diaphragm piston, is intended to be applied in all " cases where pistons are used in machinery of any description. " The new kind of piston consists of a prismatic, cylindrical, or other shaped piston or embolus, which is fixed to " or to which is secured a bag or diaphragm of any suitable " flexible material. The said diaphragm is secured in any " convenient way to the inside of a cylinder or prismatic tube " or pipe, in which the abovesaid piston or embolus is capable " of performing a reciprocating motion, the same as ordinary " pistons."

The piston fits loosely into the tube or cylinder, the latter being divided into two separate portions that are united by flanges. The flexible diaphragm has, at its upper end a flange, which is bolted between the flanges of the tubes. In one instance the piston is shown in the drawings fixed on the bottom of the diaphragm; in a second instance, the piston is fixed inside the diaphragm; and in the third instance, the diaphragm is fixed at half height.

With this improved piston, hydraulic presses may be used " for dragging sea ports in localities where a powerful column " of water may be disposed of. For this purpose, the dragging " machine is set in motion by two pistons, in the manner of a " hydraulic engine, the column of water being divided into " two branches that are directed on the two cylinders, which " are made to act alternately, so as to lose no time."

[Printed, 6*d*. Drawing.]

1855.

A.D. 1855, February 7.—No. 295.

NEWTON, Alfred Vincent.—(*A communication.*)—A "mode "of constructing dry docks."

"The natural clay foundation is used for the floor of the "dock, the sides and back end being formed of piles, the "puddling between the inner and outer piling, resting upon "the clay floor, and forming a continuation of it, after the "manner in which coffer dams are puddled. The rows of "piles are stayed by diagonal braces, and are covered by "suitable sheathing. Spur braces are driven into the foun-"dation, and secured at their tops to the interior row of "piles, for the purpose of resisting any lateral strain which "may be brought to bear against the sides of the dock. "Between the spur braces cross sleepers are laid, and upon "these the chock blocks slide in the customary manner. "These sleepers rest firmly upon the natural floor of the "dock, to which they transmit any weight which may be "imposed upon them."

A space enclosed by square piles is reserved to form abutments to resist the thrust of the dock gates. This space is filled with clay, and forms a continuation of the foundation. This piling is braced, and to these abutments the gates are hinged. The gates shut against the tops of a row of sheet piling, driven into the clay immediately within the bottom of the gate.

"The space within the body of the dock, not being required "to be left vacant, is filled with clay, and serves still further "to strengthen the sides of the dock, against the lateral "thrust."

[Printed, 10*d*. Drawings.]

A.D. 1855, March 8.—No. 526.

GERARD, John.—(*Provisional protection only.*)—"A portable "floating pier or bridge, separating into sections, which are "designed and adapted for forming floating vessels; also "*fixed and* moveable structures on land, such as sheds and "*vehicles.*"

This invention consists "of portable floating vessels with "moveable water-tight decks, sides, ends, and bottoms, and "sliding or folding frames, platforms, stays, and supports, "the whole being made and fitted together in sections com- "posed of, and separating into duplicate parts, designed for "forming a portable extending pier, bridge, or platform for "facilitating the embarking and disembarking passengers, "troops, cattle, stores, or merchandize, or for effecting a "passage or forming a roadway across water; the said sec- "tions and duplicate parts being also designed and intended "for forming works or buildings of defence, shelter, or stores "on land, and also adapted for forming waggons or other "vehicles. Each vessel, structure or vehicle can be fitted "together or separated with facility and dispatch, and "packed together, so as to occupy a comparatively small "space for shipment or removal when not in use."

[Printed, 4*d*. No Drawings.]

A.D. 1855, April 7.—No. 769.

HAYS, WILLIAM BENNETT.—"An improved breakwater."

"It consists of a series of planes or platforms placed one "above the other at suitable distances apart, inclining towards "the sea or advancing waves, so that when the waves meet "the planes or platforms, it will be subdivided into layers "and thus pass up between the planes or platforms. The "force of the wave will be thereby arrested. The angle of "inclination of the planes or platforms may be varied, accord- "ing to circumstances. The planes or platforms may be "parallel with one another, or they may vary from paral- "lelism, as may be found most suitable. The platforms or "planes may be uniformly plain, or they may be curved, "according to circumstances, and they may be perforated. "The above-described breakwater may be fixed by means of "piles, or otherwise secured to the sea bottom; or it may "be adapted to any existing structure; or it may be caused "by any suitable means to float upon the surface of the "water, being secured by moorings or otherwise; or it may "be attached or connected to any floating structure."

The drawings represent a structure supported by piles, used *with a small depth of* water. In another instance, the break-

water is secured in front of a moored raft. In a third example, suitable for deep water, the breakwater is allowed free play in a vertical direction, by means of friction rollers that work in guides fixed to a sea wall or detached pier. Lastly, a circular raft is described and shown. This vessel is secured by moorings; the platforms may be fixed on one side, or on all sides of the raft.

[Printed, 8*d*. Drawing.]

A.D. 1855, September 8.—No. 2033.

TUCK, Joseph Henry.—(*A communication.*)—" Improvements " in dredging and excavating machinery."

1st. The buckets are discharged as they rise from the bed of the river. This is accomplished by the combined action of a tilting tipper and of a self-acting catch on the buckets. " The " tilting tipper turns on a pivot or centre on which it is " raised by the ascending bucket, and in falling back again " strikes against the tail of the self-acting catch of the bucket, " and allows the bottom of the same to fall open by turning " on a hinge." The catch is balanced " in such a manner as " to fall by its own gravity upon the hinged bottom or lid of " the bucket in its descent, and thereby to close the same " preparatory to the entrance of the bucket into the water or " the soil to be excavated."

2nd. The dredging wheel is kept in gear with the engine, while the shaft of the said wheel is raised or lowered, " by " means of a radius bar on each side of the wheel, extending " from its shaft to that of the pinions through which the " wheel is set in motion. By means of these radius bars the " shaft of the driving pinions is always kept at the same " distance from the shaft of the wheel. For this purpose the " pinion shaft is mounted on a carriage, which is drawn in or " moved out so as to correspond with the change of position " of the wheel shaft."

[Printed, 1*s*. Drawings.]

A.D. 1855, September 13.—No. 2070.

TUCK, Joseph Henry.—(*A communication.*)—" Improvements " in apparatus for carrying on submarine operations."

A great part of this invention relates to a diving bell and its appurtenances, combined with tools or instruments, together with the method of working the same.

The only portion of the invention which can be set forth is this place relates to an apparatus for sawing piles under water. The saw is mounted within a space formed at the lower part of the bell in such a manner as to be capable of working horizontally between guides; it may be actuated by hand or by suitable mechanism inside or outside the bell. "The saw "works horizontally and on an exact level with the bottom "of the bell, which is also level, as the bell is always resting "on the heads of several piles," "it will be evident that the "piles will be all cut to the same level without further diffi-"culty or adjustment." "In order to move the bell after "sawing off a pile for the purpose of commencing on another, "a quantity of water is expelled from the tanks sufficient to "render the bell light enough to be readily moved to the re-"quired position (which is ascertained through the opening "in which the saw works); water is then admitted into the "tanks, and the bell settles firmly on the tops of the piles "already sawed, and remains firm in its position until the "pile is cut off. In commencing operations, a pile has to be "driven to the required level, and this will serve as a starting "point for the bell, and will determine the point of elevation "at which the successive piles are to be cut."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1855, September 26.—No. 2147.

BOUCHET, Felix.—"An improved mechanical arrangement "for elevating or lowering and moving forward or backward "heavy or submerged bodies."

The mechanical arrangements which form the subject of this invention "are particularly suited for the excavating or "curing of canals or rivers, and canalizing these latter for "hydraulic constructions, and raising submerged bodies."

In the arrangement for excavating canals, two "capstans" (or triangles) are employed one at each side of the canal; these capstans are connected by a strong rope, on which a carriage is made to move forward and backward by means of ropes, guided by pulleys and acted upon by cylinders or windlasses

and gearing "situated at the lower part of the capstans." To move the cylinders, a horizontal shaft is used; the said shaft carries sliding nuts which may be made to advance or recede when required bymeans of a horizontal cranked fork furnished with a toothed rack and pinion. As soon as the pinion leaves the gearing, a brake raises a lever, by which the load may be kept at a given height whilst the carriage is moved forward and backward. The load may then be raised by the application of steam power to the horizontal shaft.

[Printed, 10*d*. Drawing.]

A.D. 1855, September 29.—No. 2169.

ADAMSON, GEORGE. — (*Provisional protection only.*) — "A "travelling staging and crane or jenny, adapted for building "piers & other harbour works."

The staging is placed on the work and advances as the work progresses. For this purpose the inventor uses "a large "rectangular framework of nearly the width of the pier; at "the lower part it is mounted on wheels, & placed on the level "of the top of the pier." The upper work of the frame overhangs the width of the pier, to give sufficient breadth to the traverse of the crab. Two long trussed overhanging beams project forward in the direction in which the building is in progress. "The main part of the staging on the finished "work must be of sufficient length & weight to sustain the "weight at any time hanging on the projecting beams to "prevent overbalancing. Rails or ways are formed on the "lower platform of the staging, on which the materials are "drawn in. The projecting beams are carried the whole "length of the staging, so that the traversing crab or jenny "is run in above the materials to be lifted from the lower "platform, & thereby moved & deposited as required. Suitable gangways & platforms & working gear are provided as "in ordinary staging, the whole constituting part of the "travelling staging or machine which is moved bodily forwards as the work progresses. When a portion of the work "is finished up to the travelling level of the staging, it is "moved forwards on the new work to the required extent, "when another portion of the work is finished, & so on."

[Printed, 4*d*. No Drawings.]

A.D. 1855, December 18.—No. 2868.

GLOVER, Frederick Robert Augustus.—"Improvements in "the construction of breakwaters, sea walls, and other structures or foundations of structures which lie partially or "entirely under water."

1st. Constructing the said structures "by so forming a "framework of timber or iron, or other material, and so "anchoring or fixing the same, as to collect and retain the "shifting sand or material carried by the movement of the "water in the particular situation in which any such struc- "ture is being erected." The drawings show a number of frames of ordinary beams of timber placed one upon another. "The superposed frames gradually diminish in width from "bottom to top, so as to give a suitable slope or inclination to "the face of the work."

Instead of the said structure constituting one solid mass throughout, the framework may be made so as to leave one or more hollow chambers, which will not become filled up with the shifting sand. Therefore subaqueous roadways, passages, or other tunnels may constitute a portion of the said framework, in which case tubes of timber or of iron may be conveniently employed. Communication may thus be formed across streams or channels.

2nd. "Constructing the said structures, by forming them "as above set forth, and by adding lime, or cement, or con- "crete materials, either to assist in the retention and solidifi- "cation of the said shifting sand or material, or else partially "or entirely, instead of the same." The cement preferred is Italian puzzuolana.

[Printed, 8*d*. Drawing.]

A.D. 1855, December 27.—No. 2929.

DOUGLASS, Nicholas.—"Improvements in the construction "of lighthouses, beacons, piers, and other similar erections."

This invention relates to a mode of employing iron or other metal cylindrical piles for the foundations of the above-mentioned structures. These cylinders are hollow, and are floated by means of an arrangement of pontoons that carries several cylindrical piles in position.

Increased strength is given to the said erections "by adopt- "ing the form of fluted corrugations."

Each pontoon is hexagonal, and is made by laying tubes horizontally, "and bolting them together in such a manner as "to carry any required length of cylindrical piles, either vertically or at any desired angle, in position ready to be erected, "each pile closed at bottom to exclude water, and increase the "buoyancy of the pontoon." A substantial wood framing is erected on the pontoons; this carries a barracks for tools, stores, and workpeople, as well as a travelling crane. An external cylinder of sheet metal is passed over the piles, and bitumen is run in between them. The interior of the piles at their base is closed, or nearly so, with a flanged foot piece; this can be spread out externally after the piles are in their places. "The interior of the piles can afterwards be filled with concrete or any suitable material, and in like manner also in "some cases the spaces between the piles."

When building on submerged rock, a man-hole cover may be applied to the cylinders, and air can be forced into them; they can then be used similarly to the diving bell.

[Printed, 1s. Drawings.]

1856.

A.D. 1856, January 16.—No. 113.

LAW, HENRY.—"Improvements in heaving up slips for the "repair or construction of ships or other vessels, and for a "continuous action purchase for the same, which is also applic-"able to other purposes."

1st. The cradle for the reception of the vessel is constructed with a longitudinal depression to receive the keel. The bottom of the keel is therefore wholly or partly below the surface of the rails on which the cradle runs. The railway is also formed with a corresponding depression between the centre lines of the rails. Large vessels may thus be operated upon, the rails need not be carried a great distance under water, and the vessel may be received upon the cradle in the trim in which she may chance to float.

2nd. The continuous action purchase, for drawing the vessels up the slip, has "two or more cranks and connecting rods "*so* arranged, that the connecting rods actuated by the cranks

"are made in succession and alternately to lay hold of and "draw forward the links of the chain, the action of each one "commencing before that of the previously engaged one has "ceased"; thus the continuous "progressive movement of "the chain is maintained."

3rd. The chain is folded up "upon a moveable carriage "arranged for its reception, and upon which the links are "deposited side by side in alternate directions as they are "successively drawn up by the previously described ma-"chinery, or the chain may in a similar manner be deposited "in a vertical pit prepared to receive it." By this means is avoided "the necessity of taking to pieces or disconnecting "the links of the chain."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1856, February 4.—No. 296.

PAULING, Richard Clarke.—(*Provisional protection only.*)—"Expelling water from vessels, and keeping them from sink-"ing, raising sunken vessels, keeping water out of coffer "dams, caissons, foundations, or vessels, or works that are "below water, and propelling vessels on and through water."

The only part of this invention which can be treated of in the present series of Abridgments is the third improvement. According to this improvement, compressed air is employed "to force out water from coffer dams, cassions, or other works "to be constructed below water." This is effected "by forc-"ing air into such dam, cassion, or other artificial means "that may be necessary for the construction of piers of "bridges, river or sea walls, locks or dock works, &c."; air is pumped into the chamber by means of an aperture or apertures at the bottom, after having made the top of the dam or caisson air-tight, "thus expelling and keeping the water "out by closing such aperture or apertures with slide valves."

[Printed, 4*d*. No Drawings.]

A.D. 1856, February 8.—No. 339.

ROBERTSON, Stewart, and HOWDEN, James.—(*Provisional protection only.*)—"Improvements in machinery or "apparatus for driving piles."

In these improvements, the general arrangement and construction of the pile engine framing resembles that of existing machinery.

In this invention, the essential object is the automatic or self-acting re-arrangement of the ram or monkey after each fall.

In the first modification of the apparatus, a vertical screw-bladed shaft is kept in constant rotation by the steam engine. A pulley in connection with the sliding bar of the monkey is ordinarily in gear with the screw blades. Upon the weight of a crank lever being raised by an adjustable throw off piece, the pulley is drawn out of gear with the screw blade and the monkey falls; at the bottom of its fall the screw blade again engages with the pulley and the monkey rises.

In a second modification, an endless chain is made to raise the monkey, the chain being kept in constant motion, and a sliding bar and weighted crank lever being used to engage and disengage the ram.

In a third modification, vertical water cylinders and plungers are used to raise the monkey. The engine shaft constantly works force pumps, and when the monkey is required to drop, the opening of a valve discharges the water.

A fourth contrivance resembles an ordinary crab winch. Pulley arrangements are adopted to obtain a long stroke of the monkey with a short stroke of the steam piston.

By another contrivance, a continually revolving eccentric is made to work in the bight of the hauling chain, one end of the chain being fast to the pile head.

[Printed, 4*d*. No Drawings.]

A.D. 1856, February 9.—No. 350.

SCHWARTZKOPFF, LOUIS.—"Improvements in apparatus "for raising mud and soil from the bottoms of rivers and other "waters."

"A centrifugal or rotary pump is fixed on board a suitable "vessel, together with a steam engine or other means of "working the same. From the pump descends a suction "pipe, arranged suitably to admit of its lower end being "moved to and fro. The lower end of the suction pipe is "fitted with a head or instrument (or the head or instrument "may be separate), which on being moved together with the "lower end of the pipe, stirs or moves the mud and soil "at the bottom of the river or other water, by which means "the mud or soil, together with some water, will be conti-

" nually raised by the pump, and the same may be allowed to " run on to a bank at the side of the river or other water, or " into any barge or vessel employed for carrying away such " soil or mud."

In the drawings the expanded end of the suction pipe is shown with a series of rake teeth placed round its edges. By means of fast and loose pulleys, and the weighted arm of a quadrant, an oscillating sideway motion is given to the suction pipe.

[Printed, 8*d*. Drawing.]

A.D. 1856, March 6.—No. 565.

MORRISON, Robert. — "Improvements in pile driving " machinery."

According to this invention, two or more rows of piles may be driven simultaneously by the direct action of steam. The number of steam cylinders are equal to the number of rows of piles to be driven at one time. "The cylinders and valve " gearing are carried in suitable supports on one end of a " travelling carriage running on wheels, and a vertical tubular " boiler and small steam engine for hoisting the piles and " raising the cylinders when they have each driven a pile are " carried at the other end of the carriage."

The ram or actual pile-driver is formed in one solid piece with the piston, and it is caused to work through both ends of the cylinder. The ram is guided by means of the top cover of the cylinder. The steam is used on both sides of the piston, A balance valve apparatus is used in place of the self-acting gearing for regulating the admission of the steam into the hammer cylinder.

The small steam engine which is employed "for raising " the cylinders after they have done their work; and hoisting " fresh piles to deposit under the rams, is an inverted trunk " engine, the lower end of the trunk being flattened to such " an extent as will balance the weight of the piston trunks " and connecting rod."

" As fast as each pile in a row is driven, the machine is " traversed forward between the rows to the next piles, and " so on, until the whole of the piles in each row are driven."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1856, April 3.—No. 808.

WHITE, Thomas, junior.—"Improvements in slips and ways "for receiving ships or vessels requiring repair, and for "apparatus to be used for hauling up ships or vessels."

Instead of providing the way with rails carried down to the bottom of the slip at the same incline, they are carried down "only to a point a little below the head of the vessel to be "operated on," and then curved beyond or below that point, so as to bring the end of the rails to a horizontal or nearly horizontal position.

In arranging the part of the slip or way upon which vessels are intended to be placed while under repair, a lateral way is constructed at a convenient part of the upper way, on one or both sides of the longitudinal way, and at right angles thereto. When the carriage with the vessel thereon is brought up the longitudinal way as far as the lateral way it is moved laterally off the longitudinal way, "so as to admit of other "vessels being carried past if required."

In the apparatus for hauling up ships, a second or runner chain is employed, "by which the power of the hauling up "machine or motive power is doubled without occasioning "any additional stress upon such machine." "This second "or additional runner is worked by a claw, which makes "the traction rods that connect it with the runner a con-"tinuous chain, and renders it unnecessary to stop the "engine when the rods leading from the cradle to the chain "are to be shifted."

[Printed, 10*d*. Drawing.]

A.D. 1856, August 25.—No. 1978.

BARRAT, Pierre Philippe Celestin, and BARRAT, Jean Baptiste. —(*Provisional protection only.*)—"Improvements in "steam digging apparatus suitable for draining and exca-"vating purposes; parts of which are applicable to reaping."

1st. Placing the running wheels behind the furnace.

2nd. The wheels have a sheet iron felloe, rivetted to T-iron spokes.

3rd. Dividing the nave of the large wheels into two parts.

4th. Providing "play between the nave and axle."

5th. Throwing the motive wheels out of gear by means of an arrangement of couplings, forks, and levers.

6th. Driving the fore carriage wheels simultaneously with the motive wheels.

7th. Placing skids on the peripheries of the motive wheels.

8th. Causing the fore carriage to follow the undulations of the soil.

9th. Employing steam to tilt the fore carriage.

10th. Connecting in a straight line the digger carrier and the framework.

11th. Moving the digger shaft nearer to or further from the soil.

12th. Effecting the up and down action of the diggers by cams, &c.

13th. Regulating the back stroke of the diggers by a stop.

14th. The employment of two diggers of different lengths on the same stock.

15th. The employment of three or more diggers on the same stock.

16th. "Applying the machinery for excavating and digging "canals and drains."

17th. Mounting forks or teeth behind the engine driver's seat or the digger carrier, to pulverise the earth.

18th. Working the digging shaft by means of fixed cylinders and connecting rods, instead of by oscillating cylinders.

19th. Dispensing with one of the shafts which carry the gearing wheels.

20th. Applying the apparatus for reaping.

[Printed, *4d.* No Drawings.]

1857.

A.D. 1857, January 6.—No. 45.

KENNARD, THOMAS WILLIAM.—(*Provisional protection only.*)— "Improvements in metallic piles."

"I construct piles whose transverse section is in the form "of a cross, or which may consist of three or more leaves "or plates connected together; the outer edges of these "leaves are thicker than the other parts, or they are made

" with a rib or bead. By this disposition of the metal the " pile is rendered much stronger and stiffer than if the same " quantity of metal were arranged in leaves of uniform " thickness. I manufacture these piles in various ways: " thus, I roll flat bars or plates of iron with a thick bead " on one edge, and I unite the other edges of three or more " of these bars by means of angle irons and rivets or bolts " and nuts; or the edges of the bars may be bent and rivetted " together; or I roll a flat plate or bar with beads or ribs at " both edges, and I rivet or bolt to the flat sides of this bar " other bars rolled with flanges for that purpose; or I connect " together two or more bars having beads or ribs on each " edge. In some cases the piles may be made wholly or " partially of cast iron."

[Printed, 4*d*. No Drawings.]

A.D. 1857, January 7.—No. 62.

HILL, HENRY CHARLES.—" Improvements in screw and lifting " jacks, and in machines for lifting, pressing, and lowering."

This invention consists in obtaining leverage by the combination "known as the lazy tongs." Amongst other applications, the invention is applicable "to pile-driving and dredging " machines."

The drawings show a mode of working collapsing sheaves or lifts, which may be applied to pile-driving engines. The example given in the drawings is "a folding or collapsing jib " crane, with the jib distended or collapsed by a series of " joints or levers similar to the movements of the lazy tongs." Lever and screw gear are used to distend the jib or to fold it against the pillar.

Another mode is set forth, also applicable to pile-driving engines. This consists of a collapsing chain lift, in which the power is obtained from a series a lazy-tongs levers worked by a central right and left hand screw, passing through screw-threaded sockets; attached to the upper and lower ends of these levers is a frame carrying a series of sheaves and friction pulleys, over and around which passes the chain; "these " levers expand and contract by means of the screw, and con- " sumes or let out the chain, that is to say, it lengthen or " shorten the chain as the lever are raised or lowered or " *contracted*."

To lift great weights speedily, chain barrels of a peculiar construction may be employed; these barrels are applicable to pile-driving machines. Of the combination of two barrels, one may be straight (or cylindrical) and the other conical, or they may both be conical barrels, the cones being reversed.

[Printed, 1s. 4d. Drawings.]

A.D. 1857, January 8.—No. 75.

TURNBULL, ROBERT.—"Improvements in cradles for heav-" ing up ships."

For this purpose the cradle is constructed in parts, "so that " the one part may separate a certain distance from the other, " while at the same time the parts of the cradle are suitably " tied and held together to limit the separation and to keep " them in their proper relative position while either elongated " or contracted; when contracted, the cradle is considerably " less in length than the ship which may be lifted on it.

"In placing a ship on the cradle, the parts of the cradle are " brought close together and lowered down the ways, and " the ship brought over it so as to ground or take the front " part of the cradle, with her fore foot a little in front of the " forc part of the cradle, her stern at the time projecting a " considerable distance beyond the after end of the cradle. The " cradle being now hove up on the fore part advances up the " ways, and lifts the fore part of the ship, the after part at the " time being afloat and not on the after part of the cradle. Dur-" ing this time the other parts of the cradle remain stationary, " and until the fore part has advanced, say, about fifteen or " sixteen feet (the limit of its sliding connecting bars). " Having arrived at this limit, the second part of the cradle " follows the first up the ways, and separates from the after " part until it has moved the distance of, say, ten or twelve " feet, as limited by the connecting bars; the whole cradle " now (if in three parts) moves together. By this time the " stern of the ship will be brought immediately over the after " part of the cradle on which she settles or grounds, and is " supported as in ordinary."

The drawings show a cradle formed in five principal parts.

[Printed, 10d. Drawing.]

A.D. 1857, January 19.—No. 157.

CLARK, Edwin.—"Improvements in floating docks."

"This invention consists in arranging a floating dock so "that it may be sunk in order to receive the ship, and after-"wards, having received the ship, be floated by pumping the "water from the space between the side of the ship and the "interior side of the dock." The dock rests on the bottom, and the air vessels (necessary when the dock is kept floating while receiving the ship) are dispensed with.

The dock consists of a pontoon or vessel composed "of an "iron shell bolted to transverse girders or frames built up "of sheet and angle iron, and also to longitudinal ribs, which "connect these transverse frames. This vessel has blocks "bolted on its bottom, on which it rests when sunk, and its "sides are higher than the draught of the largest ship it is "required to dock. When the floating dock is to receive a "ship, it is sunk on a bottom suitably levelled, and where "the depth of water is not so great as the height of its sides "a gate which closes at its end is now opened and the ship "is floated in; the gate then being closed and the ship "suitably shored, the water is pumped out. If the dock is "to be used in a tideway, it will not be necessary to make "its sides so high as the draft of the ship to be docked, as it "may then be sunk in water sufficiently deep to rise over its "sides, provided only that its sides be uncovered for a suffi-"cient time at low water to allow the dock to be pumped out "so as to float it. If the rise and fall of the tide be large it "will not be necessary to provide a gate at the end of the "dock, as the ship may be floated over and allowed to settle "down into it as the tide recedes. The dock is furnished "with a valve or opening to let the water run out."

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1857, January 19.—No. 159.

CLARK, Edwin.—"Improvements in machinery or apparatus "for raising ships out of the water for the purposes of exami-"nation and repair."

A series of columns is erected "in two parallel rows at some "suitable place where the water is sufficiently deep to float "the largest ship which it is intended to raise." "In connec-"*tion with* each of the columns is a hydraulic cylinder and

" ram, which by means of descending rods is connected with a " girder or girders which extend to the corresponding post in " the opposite row." Over this series of parallel girders or " gridiron," and "between the two rows of columns the ship " to be raised is floated, and the pumps in connection with " the hydraulic cylinders are set to work so as to bring each " girder to bear against the keel of the ship, which is then " shored in the ordinary manner." Instead of the ship resting directly upon the gridiron, it may repose and be shored up upon a strongly framed platform placed upon the girders of the gridiron. Instead of the platform a large iron vessel called a "saucer" may be used to each ship, and the ship and saucer raised together and floated away. The ship being placed either upon the girders or upon the platform or upon the saucer the pumps are simultaneously set to work and the girders are lifted, "and are prevented from " again descending by closing the water in the presses, or by " palls" which fall into teeth on the columns.

The said columns are erected by sinking cylinders, and excavating from the interior of them.

The hydraulic cylinders are divided into separate sets, so that each set may act independently of the other sets, "in " place of connecting all the cylinders to one pump and to " one main pipe, as has before been proposed to be done."

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1857, February 19.—No. 486.

ABERNETHY, James.—(*Provisional protection only.*)— " An improved mode of constructing breakwaters in deep " water."

"My invention consists in confining a rubble embankment, " forming the base of the breakwater, within a timber frame- " work, the rubble embankment having in similar cases " hitherto been allowed to form its own slope by the action " of the sea. The cross timbers, of which the framing is " composed, and by which the two sides of the breakwater are " bound together, are framed on land, and lowered into their " position without the necessity for driving piles, except as " an after-work. The cross frames are bound securely together " and the structure completed for the reception of the rubble

" by timber panelling in suitable sections, also framed on " land, and lowered into position between the cross frames in " such manner as to tie them effectually one to another, so as " to form a continuous structure, whereby the rubble may be " securely retained and protected against displacement by the " action of the sea."

[Printed, 4d. No Drawings.]

A.D. 1857, February 20.—No. 497.

BROOMAN, Richard Archibald.—(*A communication.*)—(*Provisional protection only.*)—" Improvements in steam digging " apparatus suitable for draining and excavating purposes, " parts of which are applicable to reaping."

1st. Placing the running wheels behind the furnace.

2nd. The wheels have a sheet iron felloe, rivetted to T-iron spokes.

3rd. Dividing the nave of the large wheels into two parts.

4th. Providing "play between the nave and axle."

5th. Throwing the motive wheels out of gear by means of an arrangement of couplings, forks, and levers.

6th. Driving the fore carriage wheels simultaneously with the motive wheels.

7th. Placing skids on the peripheries of the motive wheels.

8th. Causing the fore carriage to follow the undulations of the soil.

9th. Employing steam to tilt the fore carriage.

10th. Connecting in a straight line the digger carrier and the framework.

11th. Moving the digger shaft nearer to or further from the soil.

12th. Effecting the up and down action of the diggers by cams, &c.

13th. Regulating the back stroke of the diggers by a stop.

14th. The employment of two diggers of different lengths on the same stock.

15th. The employment of three or more diggers on the same stock.

16th. " Applying the machinery for excavating and digging " canals and drains."

17th. Mounting forks or teeth behind the engine-driver's seat or the digger carrier, to pulverize the earth.

18. Working the digging shaft by means of fixed cylinders and connecting rods, instead of by oscillating cylinders.

19th. Dispensing with one of the shafts which carry the gearing wheels.

20th. Applying the apparatus for reaping."

[Printed, 4*d*. No Drawings.]

A.D. 1857, March 4.—No. 634.

TREEBY, Thomas Wright Gardener.—(*Provisional protection only.*)—" Improvements in sewers and gulleys, and outfall to " sewers and gulleys and of sewage."

The second portion of this invention is " an improvement " in sluice gates, to prevent the sewage passing up rivers or " brought towards the land as the tide flows." First, a gate or door moves vertically in grooves, slots, guides, or otherwise. Second, the inventor proposes " to have one or more " cassoun or floats to rise and fall, as the tide ebbs and flows, " attached to the sluice gate or door to open and shut it. " These may be made of wrought iron or other material " suited for the occasion, and may move in slots, grooves, or " other guides for the floats to rise and fall with the tide, so " as the tide recedes the floats fall with the gate, which " allows the sewage or water to escape with the tide; and as " the tide flows, the float or floats, and gate or gates or door " rise, close the mouth of the sewer, and prevent the sewage " or water passing out, and thus preventing any sewage or " water passing up rivers or coming towards the coast, as " it can only escape when the tide recedes. This apparatus " is all self-acting."

[Printed, 4*d*. No Drawings.]

A.D. 1857, March 7.—No. 667.

LUNGLEY, Charles.—" An improved mode of constructing " dry docks and basins for the stowage of ships."

According to this invention when it is suitable the natural level of the land is made use of to build up the dry docks therein in any suitable manner. In constructing a series of dry docks, they are all connected with a common reservoir,

arranging them in groups, the docks composing which lie parallel to each other. These docks are severally cut off from the reservoir by means of gates or caissons, and the water is maintained "in the reservoir at a spring tide, or an artificial " height by suitable pumping engines." The reservoir is connected "with the river or sea by means of an outer dock " or channel provided with double gates or caissons, so as to " allow of an artificial height of water being made therein."

In place of excavating the dock it may be made of iron or wood lined with stone. "A dock thus formed is to be floated " to the spot prepared for its reception, and then sunk, and " connected by means of gates with an inner dock or " channel."

The drawings show a railway tunnel formed below the range of dry docks; this arrangement forms an easy way of unloading vessels. The vessels are provided with ports in the bottom, and there are corresponding holes in the bottom of the dry dock, the ports and the holes being ordinarily closed water-tight. A series of trucks on the railway receive in succession the coals or other cargo, which is delivered from the dry dock, or from the ship therein.

A part of the dock may have a raised bottom.

[Printed, 1s. 6d. Drawings.]

A.D. 1857, April 9.—No. 1008.

TURNBULL, Robert.—" Improvements in slips or ways for " heaving up and moving ships, and in cradles for the " same."

This invention relates to improvements on the methods set forth in No. 75 of the year 1857.

The cradle is formed in detached transverse sections, which are readily connected by sliding rods or connecting bars.

"The sections of the cradle are distributed at equal dis- " tances apart under the ship's bottom, and she is hove up " on them as on an ordinary cradle. The frames or plates of " the slip are divided into lengths at distances according to " the lengths of the sections of the cradle and the spaces " between them. The alternate parts of the slip are arranged, " the one series of parts on the solid ground, while the next " is mounted on rollers, and supported on subways or on " hollows and rounds placed transversely to the heaving up

"slip. When the vessel is hove up the several sections of the "cradle rest on the moveable frames or plates of the slip, and "when in this position the vessel may be moved sideways away "from the heaving up slip. When so moved the vessel is then "shored up at those parts between the sections of the cradle; "the connecting bars of the several sections or parts of the "cradle may then be removed, and the cradle traversed trans-"versely from under the vessel to its position on the heaving "up slip in readiness to heave up another vessel."

The sliding rods or connecting bars of the different parts of the cradle "may be fixed rigidly thereto, but removeable, "for the purposes of the invention."

[Printed, 8*d*. Drawing.]

A.D. 1857, April 11.—No. 1030.

WINDER, Thomas Robert.—"An improved mode of con-"structing submarine works."

To form the foundation for a pier or a continuous wall, a floating caisson is constructed of iron plates; the masonry or materials are built within the said caisson simultaneously, "so as thereby to gradually sink the caisson or vessel at the "intended place, by the accumulating weight of the caisson "and its contents."

When building upon loose uneven ground, before sinking the caissons filled with masonry, a casing is first sunk of larger area than the caisson, "on to the spot destined to receive "the block;" the casing acts as a shield or kerb. By means of a diver and diving bell, the earth is excavated from within the casing until solid ground is reached, and thereby the casing sunk into the ground. The loaded caisson may then be sunk in the casing, and the said casing may be removed so as to be again employed in like manner. If desirable the piers or walls may retain their casing, "and the space between the "outer casing or shield and the caissons within may be filled "in with concrete, or if desired both the coverings may be "removed and employed in assisting in the construction of "other parts of the work."

[Printed, 1s. 10d. Drawings.]

A.D. 1857, April 13.—No. 1039.

NEWTON, William Edward.—(*A communication.*) — "Im-
" provements in the construction of boats, buoys, floats, or
" other buoyant vessels."

The buoys that may be constructed according to this invention entitle it to be placed in this series of Abridgments.

This invention consists " in the employment of gutta percha,
" or gutta percha mixed with common glue and other ma-
" terials in a heated state, and the forming it in previously
" prepared moulds, either so as to complete the desired boat
" or vessel at one pressure and in one entire piece, or to pre-
" pare the air chambers, 'timbers,' supporters, thwarts, and
" other parts separately, and then connect them altogether
" simultaneously and at one pressure, so as to complete the
" boat or vessel finally and at one operation."

The drawings show the operation of making a boat by means of two moulds, one an external or male mould and the other an internal or female mould. The external mould " is made
" entire or in one connection," the internal mould "must be
" divided from stem to stern in the centre, so as to make
" vertically two equal parts." "The force to be applied to
" produce the form by pressure may be hydraulic, steam or
" other power."

Cork or other light solid body may be laid in the beds of the moulds, gutta percha being applied to the general mould, and the whole vessel may be made at one pressure of the hydraulic or other power.

[Printed, 10*d*. Drawings.]

A.D. 1857, April 22.—No. 1136.

GRANTHAM, Richard Boxall, GRANTHAM, John, and SHARP, Henry.—(*Provisional protection only*).—" Improve-
" ments in graving docks."

According to the present invention docks with separat chambers are constructed " with piers and abutments, or wit
" grooves only, at various intervals along the docks, so that
" moveable caisson or other dam may be applied to either
" such piers, abutments, or grooves as the length of the vess
" may require; and it is intended that the chambers th
" made should be provided with the necessary blocks, st

" or struts, and that there should be culverts provided with " the necessary valves, sluices, and other means for stopping " out or letting in the water upon one or both sides of each " chamber, so that water may be let out from the chamber or " chambers above or within the docks nearest to the entrance " when the dam is closed, and also to let water in to float the " dam as well as the vessel within each chamber, to enable " the dam to be moved away and the vessel to float out, the " water being let in or out by pumping or other means.

"Vessels of greater length than one or more of the cham" bers may occupy the whole or part of two or more of the " chambers, the piers, walls, abutments, or grooves being so " constructed as to admit vessels being repaired with the same " and facility as in any other part of the dock.

"It is also proposed, where convenient, to have an entrance " at each end of such graving dock, to be made, as herein" before specified for a graving dock, with one entrance, and " to be provided with all like conveniences and appliances for " the proper working and using of the same."

[Printed, 4*d*. No Drawings.]

A.D. 1857, April 24.—No. 1159.

MANICO, EDWARD.—"Improvements in obtaining founda" tions for marine or other structures."

The inventor constructs "a cradle or receiver of open work " bar iron of any size or shape that may be found convenient." The shape preferred "is that of a diamond; these cradles are " to be filled with stones, for the entry of which a small opening " is left, and afterwards filled up to tally with the rest of the " bar work. Wherever a foundation is required, either at the " mouths of harbours, on shifting sands at sea, or in swamps, " river courses, or similar places on land," the inventor forms " such foundation by lowering on to the sands (if at sea) these " cradles, leaving them to be filled up with sand and gradually " to sink on to the firm rock, chalk, or otherwise; the filling " in will be effected by the action of the waves, and the sink" ing effected by their specific gravity." The process is continued "by adding any number" of the cradles "until the " foundation shall have been formed, on which a superstruc" ture may be raised either by a continued use of the cradles,

" or by masonry, or otherwise. The cradles may be attached " to each other by chains or otherwise if found desirable."

" In order to break the joints of the work, above water, half " and quarter caissons are used."

[Printed, 6d. Drawing.]

A.D. 1857, May 14.—No. 1359.

SISSONS, William, and WHITE, Peter.—(*Letters Patent void for want of Final Specification.*)—" Improvements in steam " pile-driving machinery."

" To an ordinary pile-driving machine," a steam winch is attached, which is worked with one or two cylinders connected to " the raking part of the winch frame and to a spiked wind- " ing barrel." A flat chain revolves round the winding barrel and a spiked wheel at the top of the pile frame. To lift the monkey or hammer, a pair of nippers is attached to its horns which clip a hook into the chain while in motion, and carry up the monkey, and these nippers may be struck off at any height either by hand or by self-acting machinery in order to disengage the monkey.

This invention also comprises the use of a common instead of a flat chain, " working in grooved sheaves on the winding " barrel and on the top of the frame, and by an eccentric and " wedges is made to press against the back of the hammer " and thus raise it. The base of the framework of the ma- " chine is placed on wheels, so as to move easily in any re- " quired direction, and turns on a centre pin or axle, so as to " bring the frame to any desired angle."

This invention also comprises " an arrangement for pitching " the pile by a common chain working over a sheave fixed on " the top of the pile frame, and attached to the head of the " pile and the endless chain, on which, the motion being re- " versed, the pile is drawn up. Steam may be supplied from " a boiler at a distance, or from a portable one attached to " the machine."

[Printed, 4d. No Drawings.]

A.D. 1857, May 27.—No. 1506.

GRAHAME, Thomas.—" Improvements in inland naviga- " tion."

"Two or more lines of railways are constructed on the "inclines to be overcome and where locks are situated, and "the steam engines on board the tug boats are made with "suitable gearing to enable the engines to work as fixed "engines (when the tug boats are anchored or fixed at the "top or bottom of an incline) and by suitable wire ropes, "chains, or tackle to cause the boats (when run on to wheeled "cradles, trucks, or carriages,) to be run up or down the in- "clines; and to facilitate the passing of the boats on to "trucks or carriages at the upper and lower parts of the rail- "ways on the inclines, the ends of each of the railways are "formed below the water in such manner that the trucks or "carriages may be run into such positions as to admit of the "boats being floated over them. When desirable or required "for the purposes of speed or otherwise, the tug boats may be "made to run on to wheeled cradles, trucks, or carriages "fitted with driving wheels and suitable gearing, and the "steam power on board may be used to work the tug boats "themselves when so embarked up and down the inclines; "and the arrangements of the gearing and tackle may be also "such as to facilitate the use of the counterbalancing power "obtainable when there are boats to be simultaneously raised "and lowered at any incline; or the same object may be at- "tained by attaching or filling up the wheeled cradles, trucks "or carriages with caissons, or otherwise to be filled when "necessary with water from the canals or inland water."

[Printed, 4*d*. No Drawings.]

A.D. 1857, June 2.—No. 1553.

BENTLEY, Newton, and ALCOCK, John.—"Improvements "in machinery or apparatus for forging and stamping metals, "which is also applicable to pile driving, crushing ores and "seeds, beetling and fulling woven fabrics, and other similar "purposes."

"We attach one or more hammers, stamps, or fallers each "to a vertical bar or slide, which rises and falls in suitable "frames or bearings. On this vertical sliding bar we fix a "stud or pivot, with or without an antifriction pulley, which "being acted upon by an intermittent spiral cam placed on a "vertical shaft, causes the said hammer, stamp, or faller to "rise and fall at any required distance; or we place the cam

" itself upon a vertical bar or shaft, at the lower end of which " is the hammer or stamp, both rising and falling together. " The spiral intermittent cam is formed by having upon a " cylinder, shaft, or disc one or more spiral projections, either " internally or externally, extending only over a part of its " circumference, leaving a space or spaces between each ter- " minus of the projection. The said cam may be raised or " lowered on the vertical shaft, and fixed in any desired posi- " tion, for the purpose of adjusting the length of lift or stroke; " or the position of the stud on the bar or shaft may be " regulated for the same purpose. When the stud or pulley " is at the commencement of the spiral projection the lift is " the greatest, giving the heaviest blow; but when near the " other terminus the lift is the least, giving the lightest blow. " The space or spaces in the cam or spiral projection permit " the falling of the hammer, stamp, or faller."

[Printed, 10*d.* Drawing.]

A.D. 1857, June 20.—No. 1729.

CLARK, Edwin, and TUCK, Joseph Henry. — (*Provisional protection only.*)—"Improvements in blocking or supporting " ships and other vessels for the purposes of docking them."

Blocks are drawn by tackle towards the keel of the vessel to be blocked, until they bear against the side of the vessel; the blocks are retained in position by racks and palls. "The " blocks are employed in sets of two or more, one working on " the top of the other, and when the first block has been " drawn against the ship, and becomes fixed by its pawls, " then the block above is similarly drawn forward on the " lower block, till it comes against the side of the vessel, " where it becomes fixed by its pawl falling into the teeth of " the rack on the lower block. In order to draw the blocks " forward chains are employed, which are connected at one " end to the blocks, pass round pulleys ahead, mounted on " the surfaces on which the blocks work, to barrels so arranged " that they can be worked from the surface of the water, by " means of a key fitting on the axis of the barrel, which is " made square for the purpose. For working two blocks, one " on the top of the other, the axis of the top barrel is made " tubular, and the axis of the bottom barrel passes through

" it. When the key is first put on, it fits on the axis of the " bottom barrel, the key being prevented from descending " lower by a catch; and when it is desired to act on the upper " barrel, the catch is withdrawn by a cord, and the key falls " on the square head of the upper barrel. The method of " blocking and supporting ships, or other vessels above " described, is very applicable, when they are raised on " 'saucers' or pontoons."

[Printed, 4*d*. No Drawings.]

A.D. 1857, July 9.—No. 1909.

RUSSELL, JOHN SCOTT.—"Improvements in apparatus and " slips for moving ships and vessels out of and into the " water."

These improvements consist "in constructing slips and the " apparatus connected therewith so that the keels of the ships " to be raised or moved thereon may be received on to the " slips and apparatus in a line transversely of the fixed ways " or rails of the slip, and where the extent of frontage is " considerable it is desirable to construct the carriages used " to receive the ships of several parts, each capable (by its " chain and capstan, or other tackle or mechanical power used " therewith) of being moved up and down the fixed ways or " rails of the slip, and also of being used conjointly with " other of the carriages when the length of the ship to be " received and moved thereon requires the combined use of " several."

In constructing the carriages, "each carriage is made with " an incline on its under side to correspond with the incline " of the slip, whilst the upper part of the carriage is made " horizontal and suitable to receive a ship in a transverse " direction."

Any motive power may be employed to raise the ship. Several steam drums may be geared to the same shaft. "The " power of the hydraulic press may also be used for taking " up chains attached to carriages for raising vessels on slips, " such as are above described. The resistance of water in " cylinders acting on pistons or rams may also be used for " lowering ships on such slips. In such cases the speed at " which the water is allowed to be moved away from the " pistons or rams is to be regulated by stop-cocks or valves."

[Printed, 4*d*. No Drawings.]

A.D. 1857, July 27.—No. 2037.

WILLIAMS, William.—(*Provisional protection only.*)—" Im-" proved graving slips for the repairing of ships."

This slip commences at a sufficient depth of water to allow the vessel to be placed on the wrought-iron cradle. The vessel is fixed on the centre of the cradle by means of vertical ribs that rise up on each side of the cradle.

The cradle, with the vessel thus secured, is to be drawn up by machinery to the top of the incline; this portion of the incline is a lifting bridge, secured by a hinge joint at the top end, and the bottom end is to be lifted, when required, by the aid of an hydraulic press, so as to bring the bottom end on a level with the other. "Thus the vessel and cradle are placed " on level ground, and may be drawn to any distance required. " The ground adjoining is to be laid out for shipwrights' " yards, with iron plates or rails, at right angles to the pro-" posed slip, so that the vessel when removed opposite to any " particular yard, to be repaired, may be drawn by means of " a crab, winch, or otherwise along the rails laid down for " that purpose, and on wheels underneath the cradle, which " are to be placed at right angles to the wheels, traversing " the slip into the yard alongside of a proper permanent " staging there ready for any repairs required."

The longitudinal slip should be kept at all times clear of every obstruction, so that with the last-mentioned improvement, "the removal of any vessel or vessels from any parti-" cular yard or yards may take place without interfering or " obstructing the work on any other vessel or with any other " yard; thus one slip only will be required for any number " of yards."

[Printed, 4*d*. No Drawings.]

A.D. 1857, August 24.—No. 2239.

HAMILTON, Alfred.—"Improvements in the construction " of and in mooring buoys, beacons, floating lights, and other " floating vessels and bodies."

Each of these vessels is formed of an annular shape, but it may have a platform or deck formed above the central open space. "The bottom of every such structure should be flat, " and the outer side thereof formed as though the structure

" were composed of two equal and similarly truncated cones, " the one inverted upon the other, so that their smaller ends " should be in contact, the line of floatation coinciding with " the line of contact of such cones." The structure may be either circular or elliptical.

"In mooring such floating structures, the mooring chains " or cables are made fast to the body on the inner side thereof, " and at or near the centre of the open space." The apparatus for mooring consists of a structure that, if unconstrained, would float, but which is sunk to a suitable depth by chain cable. The beacons are secured to this mooring vessel by a chain suspended from a point within themselves fastened to a chain passing through the submerged body.

A "self-acting brake" to secure the position of the floating body consists of a shutter fixed to the said body at right angles to the direction of the mooring.

A self-acting screw or paddle consists of a screw or paddle wheel in connection with springs or weights, which are wound up by the pressure of the water, but which in unwinding restore the vessel to which it is attached to its original position.

[Printed, 10*d*. Drawing.]

A.D. 1857, September 1.—No. 2293.

LENOX, George William.—" Improvements in apparatus for " sounding alarums at sea."

Buoys, floating lights, and other floating bodies anchored at sea, "are made with keels, or in such manner that they will " turn with the tide, and through or under such floating " bodies passages are formed below the lines of floatation, " through which the water will flow, and within these passages the lower parts of undershot wheels are applied. On " the axes of the water wheels are cranks, which give motion " to rods which pass through guides near their upper ends. " At the upper parts of such floating bodies are fixed bells, " the hammers of which are mounted on weighted levers, " and as the upper ends of the connecting rods are raised " they come under, lift, and pass the tail ends of the hammer " levers, which descending by their weights strike the bells."

Besides the above apparatus with undershot water wheel work, the drawings show a bell belonging to a buoy, the said bell being worked by floats or pistons and vertical rods.

The stern of a ship is shown with a water wheel turned "by "the flow of the tide or current." The water wheel is at the extremity of a long rod and actuates the bell hammer by means of a crank and levers.

[Printed, 1s. Drawings.]

A.D. 1857, September 8.—No. 2338.

MACKELCAN, GEORGE JOSIAH.—"Improvements in floating "docks."

The principle used in this invention is that of buoyancy, namely, that of "an air-tight and water-tight chamber," which "being filled or partially filled with water or air at "pleasure, will sink or float with any required degree of "buoyancy," "the power of flotation being wholly dependent "upon the substitution of air for water within it." A submerged pontoon is thus made to exercise the power of a ship lift.

The drawings show a dock with pontoons at its base and hollow upright columns, or tubes springing from the lateral extremities of the pontoons. There are steps for shoring, girders, an engine and pumps, valves to admit water to the pontoons, and gangways along each side of the dock.

One of the drawings shows the pontoons sufficiently submerged to receive a ship over them in a tideless sea. A syphon empties the pontoons into a well which is below the level of the said pontoons. Thence the water is pumped out by a fixed steam engine. In another drawing, the application of a syphon to empty the ship lift in a tidal sea or dock is shown. The water is discharged by a drain into the tideway at low water, or as the tide recedes.

If a cradle on wheels be sunk with the lift and then made to receive a ship, the ship may be rolled off on to a prepared slip, and the lift and cradle are then ready to receive another ship to be similarly disposed of.

The lift may be made without the upright tubes, some of the chambers being permanently filled with air; the other chambers may be emptied of water and filled with air by means of flexible tubes.

[Printed, 1s. 4d. Drawings.]

A.D. 1857, October 3.—No. 2539.

CHOWEN, GEORGE.—(*Provisional protection only.*)—" Improve-" ments in the arrangement and construction of fog, wreck, " and other buoys."

The body of the buoy and the hemispherical cover thereto are made of iron, and each part is strengthened by ribs. A horizontal axle has its ends extended beyond the buoy, and forms the means of mounting a gimbal. A ring attached to the gimbal is connected to the lower part of the buoy by means of a chain. The air-tight vessel is so arranged that if the apparatus be used as a fog buoy, the slightest motion actuates the bell clapper and sounds a continuous alarm. The mooring cable is connected to the gimbal. " The buoy itself is ballasted " with cannon balls, and a man-hole is provided in the " hemispherical cover for obtaining access, if necessary, to " the interior. A valve stop-cock is also screwed into the " cover for rendering the vessel buoyant by charging or filling " same with hydrogen gas. To the head of the buoy a vertical " cast or wrought-iron standard is securely bolted, to the " spread arms of which a wrought or cast-iron frame is " attached to carry the bell. The upper part of the buoy " above the water line is covered in with corrugated sheet " iron, rivetted to iron stays, and the bell also is surmounted " by a similar hood or covering to throw out sound."

[Printed, 4*d*. No Drawings.]

A.D. 1857, October 15.—No. 2640.

HOPPER, WILLIAM BROWN.—(*Provisional protection only.*)— " Improvements in floating docks."

A floating dock constructed according to this invention consists " of a platform for receiving the ship, and having " under it air vessels of sufficient capacity to support the " platform with the ship upon it above the water level. At " intervals along the two sides of the platform are formed " other air vessels projecting upwards above the surface of the " platform to a height greater than the draft of the largest " ship which the dock is constructed to receive.

" When the dock is to receive a ship, water is admitted to " the air vessels under the platform, which causes it to sink " for some distance, but the dock is still kept floating by the " side air vessels, and the depth to which the platform sinks

" can be regulated by admitting more or less water to these side " air vessels. When the platform has descended to the neces- " sary depth the ship is floated over it and shored in the usual " way, then by means of pumps the water is discharged from " the air vessels under the platform, and thus the ship is " raised out of the water. In pumping the water from these " air vessels it is discharged through a pipe of which the " outlet end is maintained constantly at the water level, so " as to avoid the necessity of raising the water higher than is " requisite for its discharge."

When one dock is not long enough to receive a ship, two docks, placed end to end, may be used.

To facilitate the repair of the above-described docks, they are constructed so " that they can be divided from end to end " longitudinally."

[Printed, 4*d*. No Drawings.]

A.D. 1857, November 16.—No. 2875.

TAYLOR, James.—" Improvements in dredging machines, " which improvements are also applicable to other purposes."

This invention consists " in applying an arrangement of " direct-acting double cylinder steam engines to the roller or " drum placed at the head or top end of the dredging ladder, " by which the dredger may be caused to rotate or revolve " at pleasure, and thus supersede the use of intermediate " shafting and gearing.

" A distinct, but similar arrangement of apparatus may " be employed for working the ladder raising and lowering " apparatus, and performing other work in and about the " dredging vessel.

" For working submarine apparatus as for supplying air " to a diving bell, and for raising and lowering the same," the inventor employs " direct-acting engines combined with " crabbed gearing and pumps."

The drawings show this invention applied to double ladder dredging machines. In one instance, worm and worm wheel gear communicate motion to the drum shaft that carries the buckets, from the connecting rods of the engines. In a second instance, a spur wheel and pinion is employed instead of worm and worm wheel gear.

[Printed, 10*d*. Drawing.]

1858.

A.D. 1858, March 8.—No. 466.

STONEY, BINDON BLOOD.—" Improvements in buoys, floating " beacons, and other similar floating bodies."

This invention relates to a peculiar construction of the above-mentioned floating bodies, " by the application of cir- " cular or other keels thereto, whereby their oscillating motion " under the influence of waves is wholly or partially ob- " viated."

The drawings show a floating buoy with a circular projecting keel at its base. A modification is also represented, " wherein " the keels are disposed crossways in radial directions." The main body of the buoy may be of the ordinary shape and composed of iron or other suitable material. The ordinary water-tight bottom is fitted with a mooring chain. In the instance of the circular keel, the sides of the buoy are prolonged below the bottom; this keel " serves to steady or " maintain the buoy in a vertical position when under the " influence of winds, waves, or currents by confining or " restraining the motion of a considerable body of water." Air holes may be made to allow the air to escape freely from beneath the bottom.

In an arrangement not shown in the drawings, the inventor applies ribs or feathers to the sides of floating buoys or beacons, or he extends " the bottom of such floating beacons beyond " the sides."

[Printed, 6*d*. Drawing.]

A.D. 1858, April 19.—No. 857.

CALVER, EDWARD KILLWICK.—" Improvements in the forma- " tion of harbours of refuge, which improvements are also " applicable as a wave screen in other situations."

The said screens are employed in the formation of the said harbours, they are formed " by a series of posts arranged in a " row, with their lower ends forced into the bed of the waters " to a depth sufficient for their secure holding, whilst their " upper ends extend to a height above that of the waves at " high water." The said posts are held together by connecting ties, and supported by inclined stays. The distance

between the posts is such that the undulations of the wa will be reduced one-half in passing the screen; "the lin "posts forming the wave fence or screen correspond with "course of the current so as not to disturb its action upon "bottom of the space enclosed. The posts may also supp "a stage or gangway, or other walk.

"In addition to the simplicity and economy of the adap "tion of such system, may be added the facility it affords "any subsequent alterations to it, as experience may dict

"Screens thus formed will insure the almost unobstruc "passage of the tidal steams, the destruction of the surf "breakers, and the interception of only so much of the d "water undulation as may be found necessary for the secu "of the vessels anchored within their protection."

[Printed, 10d. Drawing.]

A.D. 1858, April 24.—No. 907.

BODMER, RUDOLPH.—(*A communication from John Johns* —An "apparatus for removing sand and similar loose mate "from docks, rivers, and waterways."

"This invention consists in carrying a pipe or tube dow "the sand or other loose material, and causing a par "vacuum in such pipe or tube by means of a pump or ot "contrivance, so that the sand or other loose materia "drawn up the pipe or tube and received in a suitable ve "for removal."

A boat may be provided "with a small steam engine "working the pump, an elastic pipe or tube reaching dow "the sand or other loose material at the bottom of the do "river, or waterway. On working the pump, the sand "other loose material is drawn up and deposited in "boat."

"In removing sand or other loose material from a water "near the shore, the engine may be placed on the shore, "when placed in a boat, as described, it will work at sea "moderately rough weather, where the ordinary dredg "machine would be useless."

The drawings represent a boat, furnished as described ab or with a dome or inverted funnel to which the said ela pipe is attached; the pipe is hooped within. The dome m be raised and lowered by means of a crab engine on boar

the boat. In some cases, the dome may be scraped along the bottom at the same time as the pumping is going on. In connection with the exit valve of the pump is an exit pipe.

[Printed, 6d. Drawing.]

A.D. 1858, July 7.—No. 1529.

SLEIGH, ADDERLEY WILLCOCKS.—" Improvements in the con-
" struction of floating sea barriers or artificial beaches, break-
" waters, and batteries."

The floating caisson on which the inclined plane rests is of a triangular shape, the base line which floats on the water being the longest. The caisson is moored on each side, and does not revolve on a centre of motion.

By elongating the base of the caisson, its inner side may form a platform for landing on from boats or ships.

Another improvement is the adaptation of the caissons with inclined planes to floating batteries or fortifications. These may be moored, or they may be capable of being shifted from place by steam power. Movable batteries may be oval. The inclined planes may be adapted to ordinary ships for use as batteries.

The floating sea barriers may be terminated at either end with a rounded caisson, " the deck of which would be useful
" for guns or a lighthouse or other purposes,"

Each section of the sea barriers is united " by a cable pass-
" ing throughout the whole range of the barriers through ring
" bolts in the bottom of each, and by four legged bridles of
" chain or hemp attached by their ends to spare shackle bolts
" in the barriers; these are all brought to one point at the
" ball-and-socket joint by means of a screw collar, thus pre-
" venting in a great degree all jerk or unequal strain."

[Printed, 8d. Drawing.]

A.D. 1858, July 8.—No. 1542.

SCOTT, MICHAEL.—" Improvements in constructing break-
" waters and other like structures."

In forming wood piles with screws, the screw is made of T or angle iron.

In constructing breakwaters, frames of woodwork are formed on shore, floated out to their destination and there sunk in

position. Each frame consists of piles placed parallel to each other and combined by means of horizontal planks fixed at intervals; each pile may be built of four thicknesses of wood. These piles are fixed to upright piles with ties, so as to form an outer piling and an inner piling. When the frames are sunk, they are kept down by stones which rest on the bottom ties.

When it is necessary to construct one face of the work of frames detached from those on the other face, the width of the frames is proportioned to the strain. Flat stone bearings for the frames may be prepared by means of divers.

In some cases the plankings may proceed from back to front, so as to form a kind of basket work.

To combine together a series of timbers under water, a sliding tie is employed. Two pieces of timber are placed, one against the front, the other against the back of two piles, and are connected together by chocks, the spaces between which are of sufficient width for the passage of the other timbers which are to be introduced and combined with the piles.

[Printed, 10*d*. Drawing.]

A.D. 1858, August 9.—No. 1808.

MURPHY, Joseph John.—(*Provisional protection only.*)—" Im-" provements in the construction of floating bodies, and in the " means of supporting floating structures."

The object of this invention is to enable a floating structure to maintain a vertical position when placed in a tide way or surf.

The structure consists of one or more inverted air-tight vessels, of such a height as to allow of a permanent air space being maintained, by which the alterations of the level of the water externally operate within the said vessel or vessels. This structure may be the foundation of a floating battery, lighthouse, or beacon. For some purposes it may be constructed in iron, and of a shape circular in plan.

In the upper part of the vessel, one or more air-tight chambers may be used as cabins. A suitable arrangement of stays, struts, and braces are introduced " to prevent collapse " or distortion or straining, either from internal or external " pressure or injury arising from other causes." The inventor

proposes "to ballast and otherwise trim or regulate the centre "of gravity, &c., of the vessel, either by loading the bottom, "inner edge, or flanch of the inverted open mouthed vessel, "or by any of the well known methods, and farther secure a "requisite degree of stability." The vessel may be so connected with an air-pump, that it can be re-charged when necessary; the degree of immersion or height of flotation may be regulated to a certain extent by means of cocks suitably disposed.

[Printed, 4*d*. No Drawings.]

A.D. 1858, September 8.—No. 2027.

HOCKIN, Bartholomew.—"Apparatus for repairing and "fitting dock gates and their machinery."

By means of this apparatus, the roller boxes, and such like submerged portions of dock gates and their machinery, may be removed, repaired, and reinstated without removing the gates.

A trough-shaped caisson is made to fit against the face of the gate, a water-tight joint being effected by means of vulcanised india-rubber strips. Close contact of the caisson with the gate is secured by bolts and nuts.

The bottom to which the caisson is attached has a steel plate with the bottom side rounded off, and thinner at the edges than in the middle. The plate is partially inserted under the gate, and a water-tight joint is made by means of india-rubber. "The rounded steel plate is intended to take the place of the "roller in supporting the gate whilst traversing upon the "circular tram or segmental rail." Instead of this, a double cranked strap with trunnions, may be fitted to the under side of the caisson bottom, a roller being mounted upon each of the trunions.

Preparatory to fixing the caisson, the gate is lifted, and the rounded steel bearing plate placed and caulked with india-rubber, the roller box being at the same time lifted to allow it to come within the line of the bottom of the caisson. The caisson is then secured to the face of the gate.

The water being pumped out of the caisson, workmen may descend to effect the repairs above set forth.

[Printed, 8*d*. Drawing.]

A.D. 1858, September 23.—No. 2141.

WILSON, John.—" Improvements in floating docks."

A floating vessel of the desired size is constructed with vertical sides and ends, a gate being at one of the ends. Each side is made hollow, with compartments, between which waterways may be established by means of valves. Each side has horizontal partitions, the upper horizontal partition forming the floor for an engine room and workshops; the water is prevented from coming into these rooms so that they may serve to float the dock although it may be otherwise full of water. Steam pumps are fixed in each of the sides of the dock with apparatus for steaming timber, and other machinery. The steam pumps are employed to pump the water out of the dock or from the compartments at the sides and end of the dock. " One end of the dock is also constructed hollow " and divided into compartments with water passages and " valves in such manner as thereby to be enabled to adjust " (by the introduction of water into more or less of the " compartments) the level of the bottom, notwithstanding " an excess of weight being at any time at one end of the " dock, and a like provision is made for adjusting the level " of the bottom of the dock by means of water being let into " more or less of the side compartments, so as to compensate " for any excess of weight towards one side. A travelling " crane is constructed fore and aft the dock, so as to be " worked by steam or by manual power, and when desired " shears are also applied, and the same may be arranged to " travel on rails fixed in the dock."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1858, November 2.—No. 2448.

Mc DOUGALL, Alexander.—(*Provisional protection only.*)— " Improvements in the construction of reservoirs, tanks, cul- " verts, sea walls, and other erections required to exclude " water or damp."

This invention consists in using bricks or blocks " made by " combining asphalt or other bituminous matter with sand, " gravel, or other grit or suitable foreign substance. This " bricks or blocks I form in regular shapes, so as to enable " them to be built up after the manner of ordinary brickwork,

" and I cement them together by using molten asphalt or " other bituminous substance."

[Printed, 4*d*. No Drawings.]

A.D. 1858, November 8.—No. 2494.

DENDY, Arthur Hyde.—" Improvements in the construction " of breakwaters or wave screens, applicable also in constructing bridges, roadways, piers, jetties, landing stages, and " other structures."

This invention consists in "constructing breakwaters by " means of a number or series of open tubes or tunnels of " a length considerably exceeding their diameter, or the " height or breadth of their waterway, disposed in layers and " laid horizontally." These tubes are so placed as to present an inconsiderable facial resistance to the direct action of the waves as compared with the mass of the structure.

According to this invention, the breakwater or wave screen is constructed "by laying down in the required position " a number or series of such open tubes, side by side, either " with or without intervening spaces, with another series of " open tubes superimposed thereon, and so on, according to " the height required."

The drawings show a breakwater constructed according to the above-described method with its face vertical; rectangular tubes are shown. The tubes are represented with dovetails or brackets to keep them in their places. Hexagonal tubes are shown; pins drop into holes to fasten these together. Corrugated plates may be employed, and, in certain positions, taper tubes may be used.

[Printed, 10*d*. Drawing.]

A.D. 1858, November 13.—No. 2550.

SWAN, Michael.—(*Provisional protection only.*)—" Improvements in the construction of floating docks, and other " floating structures."

The dock is constructed of two or more pontoons, "connected " at their lower or under edges by means of strong girders " supporting a cradle; the span between the pontoons, that " is to say, the width of the cradle being sufficient to receive " a ship. These pontoons and cradle are perfectly air tight

"at the top and sides, but are open at the bottom in place "of being closed, as heretofore, so that the water is allowed "to rise more or less within them, according to the quantity "of air contained in or forced into the upper part. By "having suitable airpumps connected with the pontoons "for the purpose of forcing air therein, and furnishing such "pontoons with escape valves, it is obvious that they may "be floated or sunk, as desired, by simply forcing air in "or letting the air escape. The engines for working the "pumps may either be carried on the decks of the pontoons "or in water-tight compartments made inside the same; "and separate air-tight bulkheads may be made in the "pontoons for the purpose of increasing the buoyancy of those "parts of the pontoons subject to the greatest pressure or "weight. The two or more pontoons should be connected "by a pipe or pipes, so that an equilibrium of air pressure "may be maintained therein."

[Printed, 4*d*. No Drawings.]

A.D. 1858, November 17.—No. 2588.

SCOTT, MICHAEL.—"Improvements in the construction of "breakwaters; parts of which are applicable in making other "structures."

This invention "is applicable in cases where the work is to "be constructed in comparatively shallow water." Rows of piles are so fixed that those farthest seaward terminate at or below low-water mark; the piles to the landward of these rise more and more, till the longest piles rise considerably above high-water mark. Diagonal timbers connect the piles, and an inclined platform is constructed on their tops. The planks of the transverse planking that forms the inclined platform have spaces left between them, "so that the water of a wave "may freely flow through the spaces between the planks. "The upper ends of the piles are connected by timbers placed "on opposite sides of the piles and bolted through, and the "transverse planks forming the enclosed platform are laid "on these timbers, and are fixed by other planks laid on "them at intervals, and notched to receive their angles, and "these upper planks are secured by bolts or fastenings "passing through them to blocks placed underneath the "timbers, which connect together the heads of the piles.

"The seaward edge of each plank of the inclined platform is "narrower than the back edge, which admits of the water "flowing easily up the inclined surface, and intercepts it "more fully on its return; and such structure allows the "flow of the water freely under and also through the inclined "surface."

Another part of this invention "has for its object the "facilitating the lifting and moving heavy weights, more "especially when under water."

[Printed, 8*d*. Drawing.]

A.D. 1858, December 30.—No. 2985.

JOHNSON, FREDERICK, and WELLS, JOSEPH HENRY GEORGE. —(*Provisional protection only*.)—"Improvements in construct- "ing breakwaters and other similar structures."

This invention consists "in presenting to the action of the "waves a surface of timber, or iron, or both combined, held "in grooved iron or wood framing fixed to piers constructed "of iron or wood piles, with screw at foot of same, the piles "being firmly tied and braced together, and on the piers of "which a superstructure may be erected applicable to the "purposes of a pier or landing stage.

"The face of the breakwater may be either perpendicular "or inclined, and in the place of presenting an unbroken sur- "face to the action of the waves, openings may be allowed "between the pieces of timber, or iron, or both combined, so "as to allow the waves to partially pass through."

[Printed, 4*d*. No Drawings.]

1859.

A.D. 1859, January 24.—No. 209.

HOMERSHAM, WILLIAM COLLETT.—"Improvements in float- "ting 'gridirons' or stages for repairing ships or other "vessels."

Two series of hollow air-tight caissons (cylindrical or otherwise shaped) are placed transversely to each other, so as to form a rigid structure on which the platform for carrying the ship is fixed. The lower series are longitudinal, and the upper series transverse.

" The sinking of the structure and the required degree of " buoyancy given to the platform are caused by letting water " into or out of the caissons." The pumping apparatus may be fixed on a platform on one or on each side of the structure and so that it is above the surface of the water when the gridiron is sunk in order to receive a vessel, or it may be fixed on shore or on another floating vessel.

" Bulkheads or partitions are fixed on the longitudinal " caissons at convenient distances apart. They are of the full " sections of the caissons or not, as found most convenient, " and are furnished with valves which may be worked as " required by means of rods, chains, or other suitable gear " from the said platforms for the purpose of trimming the " structure, and causing the keel of the vessel resting thereon " to lie in any required position." Preferably water is never admitted into the transverse caissons. Certain caissons have vertical apertures which enable them to slide freely on columns which support gangways. These caissons may be retained as required by palls taking into racks, " and the parallelism of their up and down motion may be " regulated by a shaft with bearings and pinions taking into " racks or otherwise."

[Printed, 10*d*. Drawing.]

A.D. 1859, February 12.—No. 399.

WHITE, THOMAS, and JENKINS, GEORGE.—" Improvements " in apparatus for raising and lowering ships along inclined " slips."

Two or more hydrostatic cylinders, in the same line, are each furnished with a tubular ram, through the centre of which the traction rods or chains pass. Each ram " is fur- " nished at one end with a stopper connected with a weighted " lever, and so arranged that it is free to be entered into the " joints of the traction rods or chains when the ram is to act " thereon, and to be raised or released therefrom when the " ram is no longer required to act, or is making its return or " back stroke. The several cylinders and rams are so worked " that one shall come into action just before the other has " completed its stroke, so that the hauling or lowering motion " of the traction rods or chains will be continuous. As each " ram arrives at the end of its forward stroke, it presses upon

" a catch which opens an escape valve for the escape of the
" water behind it, whilst it is run back by the action of a
" separate small cylinder worked by the force pumps, or by a
" counterweight. In lowering a ship the water is allowed to
" escape slowly from the cylinders through a small adjustable
" aperture made for that purpose in each cylinder."

In a modification of this invention, ordinary cylinders and rams are employed, the traction rod working between them.

In another modification, somewhat similar to the last, two sets of traction rods are used, instead of one only. One set is on one side of the cylinder the other set on the other side; cross bars connect them together and couple them to the rams.

The power and speed for working the pumps is regulated by adjustable crank pins.

[Printed, 1s. 4d. Drawings.]

A.D. 1859, March 1.—No. 544.

PILE, JOHN.—" Improvements in the construction of floating " docks."

Two sets of pontoons are used, one set constantly floated upon the surface of the water, the other set alternately submerged and floated for the purpose of sinking beneath the bottom of the ship and of then rising and lifting the ship with it, the water being pumped out of the submerged pontoon for that purpose by rotary pumps or other water elevating apparatus. "The first set of pontoons serves as a
" means of steadying the ship and second pontoon when
" elevated by reason of the edges of the elevating pontoon
" bearing against the under side of the floating pontoons.
" The floating pontoons are guided over the elevating pontoon
" by suitable uprights, passing through suitable apertures
" made in the floating pontoons, and connected with the latter
" or elevating pontoon chains and winches carried on the
" floating pontoons, and connected with the elevating pontoon,
" serve to prevent its immersion to an unnecessary depth,
" whilst during its elevation the slack is duly taken in. The
" dead weight of the elevating pontoon is partially neutralized
" by having air-tight spaces attached thereto, so that it may be
" more easily supported by the chains before referred to."

"In some cases a third pontoon may be used, upon which "the ship is floated away for repairs."

[Printed, 10*d*. Drawing.]

A.D. 1859, March 16.—No. 671.

MILLER, Thomas William.—"Improvements in blocking or "securing ships and other vessels whilst being removed, "examined, or repaired."

This invention consists in the employment of "hydraulic "or hydrostatic power" for the above mentioned purposes.

Hydraulic presses, consisting of cylinders and rams, are fitted upon the movable cradles or platforms of hauling up slips or upon the floor of dry docks, whether fixed or floating. The ram heads are fitted with self-adjusting cross heads, or they may come into direct contact with the sides of the vessel.

"A number of cylinders of suitable dimensions with rams "or pistons are fixed in such positions as may be convenient "for taking in and supporting any class of ships for which "the slipway, cradle, pontoon, raft, or platform is calculated "or capable of supporting, and such cylinders and their fit-"tings should vary in length, and be otherwise adjusted to "the position in which they are fixed, and to the part of "vessels against which they are intended to operate."

The pipes connecting the force pumps with the cylinders may either be fixtures to the cradle or they may be detachable therefrom. Each cylinder is fitted with a cock for shutting off the pressure, so as to maintain the ram head against the side or bottom of the vessel.

To compensate for alterations in the position of the cradle, flexible tube connections convey the pressure from the pumps to the cylinders. The flexible tubes may be coiled round drums, so that they may freely transmit pressure independent of the relative position of the pumps and the presses.

The presses may be secured in correct positions, by means of palls, which gear into ratchet teeth on the bed plate. A right and left hand screw shaft may be used to alter the position of the presses and their apparatus.

In some cases the ram may be retained in position by means of palls and racks.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1859, April 2.—No. 833.

RICHARDSON, THOMAS, and JAFFREY, GEORGE WILLIAM.—"Improvements in the arrangement and construction of "harbours of refuge, breakwaters, sea walls or barriers, and "other like structures."

"The details employed in carrying out this invention in "actual practice, consist mainly of a row, line, or series "of tapered towers, cylindrical in transverse section, and "made either of cast or wrought iron or of stone, each stone "having a clear intermediate distance or space between each "at the top, equal to its diameter. These spaces are in "each case filled in with balks of timber, cast-iron pipes "or malleable iron tubes, or other suitable material, so "arranged as to form a species of vertical lattice or screen "to break the oscillation of the waves."

The said towers may be "made and finished on shore, "and then taken out to sea by derricks, and sunk on "the exact spots necessary. Hollow metal towers of this "class may be pumped dry after being sunk, so that the "stone or other blocks used for the central filling up mass "may all be made on shore to moulds, and then laid in "their place."

"The lattice or screen frames can also be made on shore, "and dropped into vertical grooves made in the contigous "sides of the towers by the derrick." "A permanent "gangway is fitted up along the tops of the line of towers."

[Printed, 8*d*. Drawing.]

A.D. 1859, May 20.—No. 1248.

TEASDEL, WILLIAM.—(*Provisional protection only.*)—"Improvements in coffer-dams."

This invention relates to the "Nautilus coffer-dam," in which clay puddling is dispensed with.

"This dam is placed vertically on horizontal 'waling,' and "is caulked with a single tier of sheet piles driven a short "distance into the ground, with at intervals a wedging or "closing pile." When the bed is composed of stiff mud, clay, or peat, "the sheet piling may be dispensed with, the "settling down of the dam being effected by the aid of hollow "air-tight wings placed at the sides thereof, into which wings

" water may then be allowed to enter, or bags of ballast intro-
" duced for the purpose of sinking the dam and keeping it
" firmly down upon the bed. To prevent the pressure of water
" underneath the bottom of the dam stout canvas aprons are
" secured to the lower part thereof, and fastened on the out-
" side of the dam to a chain, and drawn out so as to lie on
" the bed, and held down by sand bags or other suitable
" ballast."

" The piles are confined between double wales at back
" and front."

This dam may be used "for working across or under
" the bed of rivers, canals, or tidal harbours." By means
of the wings, it can be floated in shallow water, placed in
any position, and secured by guard piles at each corner.
" When required for single piers and deep water, it may be
" floated by means of a false bottom, and when the structure
" is complete, one end of the dam is removed, and the whole
" taken for the second pier ."

[Printed, 4*d*. No Drawings.]

A.D. 1859, May 24.—No. 1277.

DAVIES, George.—(*A communication from T. Bandier.*)—
" Atmospheric apparatus for the submarine transport of
" blocks of stone, and for raising sunken vessels."

In reference to the transport of blocks of stone or other
heavy bodies under water, " the invention consists in attaching
" thereto (by chains which can be easily detached,) one or
" more vessels in the form of balloons, or other convenient
" shape; these vessels are inflated with air by means of
" pumps, and hold the blocks or other bodies in suspension,
" and thus allow of their easy transport to the required
" place."

" In using this apparatus for transporting blocks of stone or
" other bodies at any required depth in the water, the same
" air vessels are employed, but disposed in a horizontal
" position, so as to attach them to a frame, from which the
" blocks of stone or other bodies are suspended. The blocks
" are connected to the frames by chains, which can be easily
" detached by means of clicks. A certain number of these
" air vessels, each supporting a frame, are connected together

" in a line, and the whole can then be very readily towed to " required position.

" In order to vary the internal pressure of the air in the " apparatus " in proportion as the weight is raised, " a regu- " lating cock and valves are employed, which allow of the " escape of the excess of pressure at the requisite time."

[Printed, 8*d.* Drawing.]

A.D. 1859, May 31.—No. 1339.

SMITH, William.—(*A communication from John W. Nystrom.*) " Apparatus for raising and docking ships and other similar " purposes."

A pontoon is formed somewhat like a ship of considerable breadth and small draft in proportion to its length; two hollow towers are constructed, one at the bow, the other at the stern. The pontoon is divided into a number of water-tight compartments, into which water is admitted to sink the pontoon, and from which water is pumped when the pontoon and its load have to be raised. "The two hollow towers are water-tight, " and extend to the bottom of the pontoon, and communica- " tion is effected between them through a tunnel extending " fore and aft." In one tower are placed the boiler and fuel, and in the other the steam engine for driving the propeller and pumps, and the pumps, hoisting tackle, &c.

To lift a ship by these pontoon docks, steam having been raised, the water valves are opened and the external water thereby admitted into the water-tight compartments; the air cocks are then opened, and the air discharged therefrom under pressure. The sufficiently sunk pontoon is placed under the ship to be raised; or more than one pontoon may be employed. " When the vessel has been brought between the towers, the " water is pumped out from the water-tight compartments, " and the pontoon or pontoons, with the load will gradually " be raised, whereupon the ship or vessel may be secured and " blocked in its proper position; and where there are more " than two or more pontoons side by side they are to be braced " or secured together."

In some cases the pontoons may be sunk and placed side by side of the vessel to be raised.

[Printed, 1*s.* Drawing.]

A.D. 1859, June 2.—No. 1351.

SALTONSTALL, FRANCIS WALTER, and BUSH, ALFRED.—"An improved machine or apparatus for dredging and "excavating."

For dredging operations a framework of wood is mounted as a floating raft. "To the aforesaid framework the following "parts are affixed and connected, namely, a swing crane and "platform, a scoop or bucket of peculiar construction, a small "boiler engine, wheelwork, and winding barrel for coiling the "chain around during the raising of the implement employed "for excavating or dredging, and a stud wheel and chain for "swinging and holding the jib of the crane in any desired "position."

The following is the mode of constructing and operating the dredging implement:—A spur wheel, mounted in a slot in the crane jib, revolves by an endless chain that passes to the axis of a wheel near the platform. The spur wheel gears into "a "rack fixed to a long piece of square timber, to the lower end "of which is fixed a sheet iron scoop formed with a moveable "bottom." The scoop is suspended from the jib by a fork which carries "at its upper end a pulley over which passes a "chain which proceeds from the winding-on barrel aforesaid, "through the post of the crane, and over pullies attached to "the top of the jib thereof."

The scoop is lowered to its full extent below and behind the earth to be removed, it is then raised and pulled forward by the chain, so as to remove a certain quantity of earth, which, when the scoop is raised sufficiently high, may be discharged therefrom by means of a cord or chain connected mechanically to the movable bottom of the scoop.

[Printed, 1s. Drawings.]

A.D. 1859, June 9.—No. 1404.

TUCK, JOSEPH HENRY.—"Improvements in breakwaters, sea "walls, and like structures."

The said structures are made "by laying or setting the rows "of stones or blocks from front to back, so as to produce steps "or projecting angles producing water and air passages."

In some parts of the water passages, chambers of larger dimensions than the other parts of the water passages are obtained, by the setting of the hinder row of stones in advance of

the first row. These chambers communicate one with the other, from the top to the bottom of the structure and thus form air ways. The water passages are not in the same line from the front to the back of the structure. Recesses are cut in the upper surfaces of the lower rows of stones, so that the upper rows may be placed in such recesses.

To facilitate the driving of wood piles, they may be shod with iron, and "down one side or one angle of each pile a "groove is formed to receive a pipe or tube from the upper "to the lower, and the lower end is brought to near the point "of the pile. The shoe when used is perforated (or the water "may be forced out from the point of the pile through the "fork of the shoe when the body of the shoe is not perforated), "so that a stream or streams of water under pressure may be "caused to flow out during the time the pile is being "driven."

[Printed, 6d. Drawing.]

A.D. 1859, July 16.—No. 1683.

POTTINGER, Christopher.—"Improvements in machinery "or apparatus for dredging or excavating, and for driving "piles."

"The boat or foundation on which the machinery is carried "consists of a flat-bottomed punt or platform with slopping "ends." A steam engine in the centre of the punt "actuates "a short horizontal transverse shaft, which is geared to a "second shaft with a tumbler working an endless chain of "dredging buckets inclined downwards," and passed through a slot in the extreme end of the punt. "The same train of "gearing also drives a short longitudinally-disposed tumbler "for actuating a transverse endless chain of waggons or "carriers." The frame of this chain of waggons is at right angles to the chain of dredging buckets, and is extended far beyond the side of the punt. Each dredging bucket delivers its contents into a waggon; thus the excavated matter is delivered upon the bank of the river without the intervention of floating punts. By modifications this machinery may rest firmly on the soil and be used to operate over an extended surface without shifting. The dredging vessel may, in another instance, traverse round the exterior of a caisson, delivering the soil, as it is lifted, into the interior of the caisson.

A pile-driver is also in connection with the steam engine of the punt. "This consists of an over-head lever, centered at " one end upon a fixed stud in the framing, and attached by a " connecting rod near its centre to the engine. The outer " free end of the lever carries the pile-driving head, extending " well over the edge of the punt, and thus as the engine " works, both dredging and pile driving may be most effec- " tively carried on. This can also be used for extracting " piles."

[Printed, 1s. 4d. Drawings.]

A.D. 1859, August 24.—No. 1935.

RUSSELL, DANIEL, and RUSSELL, JONATHAN.—" Improving " the means of docking and lifting ships out of the water, for " the purpose of examining and cleaning their bottoms, " effecting any necessary repairs, fixing new screw propellor, " rudder, raising sunken vessels, or anything else for which " it is desirable to get at any portion of a vessel generally " under water."

This invention consists in the employment of a number of pontoons or decked barges, connected together side by side by chains, or other means, forming collectively a dock of sufficient size to carry the ship that requires to be docked.

This invention "also consists in providing at each end of " every pontoon a regulating float chamber, into which water " can be admitted by means of valves or cocks, to regulate " the sinking of the pontoons to any required depth to allow " of the ship requiring to be docked or lifted being brought " over the pontoons, or the pontoons brought under the " ship."

The pontoons are sunk by the admission of water, which is pumped out from them when the ship is in position. Down pipes are provided for the admission of air into the pontoons; these pipes always reach above water. "The ship is thus " raised, and may then be removed into very shoal water, if " found necessary. The pontoons may be used to lift one end " of a ship only."

One of the drawings represents "a sliding pontoon, con- " structed in two pieces, and united with sliding timbers or " plates." This pontoon " may be opened to suit the breadth

"of ship to be docked, and to permit of the ship being taken "into very shallow water, and over bars in rivers and har-"bours."

[Printed, 8*d.* Drawing.]

A.D. 1859, September 2.—No. 2003.

FEARN, William.—"An improved construction of buoys."

"The buoys to which the present invention relates are in-"tended principally for floating fishermens' nets and for "small anchors, but they may also be used for other ana-"logous purposes; and the objects of this invention are to "render such buoys lighter, more buoyant, and stronger than "those hitherto in use. It is preferred to make the buoys in "the form of the frustrum of a cone, the smaller end being "downwards, but they may, if preferred, be of any other "suitable form. The body of the buoy is formed of two ends, "which are tongued and grooved into the staves, and a suffi-"cient number of staves made of yellow pine, for the sake of "lightness, and the staves are made water and air tight by "means of tongues and grooves, being surrounded and held "together by metal hoops in the usual manner. In addition "to the ends being tongued and grooved into the staves, they "are connected together in the centre, and prevented from "bulging either inwards or outwards by means of a central "stay." To the smaller end or bottom of the buoy, the bracket for fastening the rope is attached; this bracket is of wood, fixed to the end by screws, and then bound over with iron tire to render it perfectly secure.

The drawings show the said buoy as described above, also a double form of the buoy in which the largest diameter is in the middle, the ends being made to taper.

[Printed, 6*d.* Drawing.]

A.D. 1859, September 26.—No. 2178.

ADDENBROOKE, George.—(*Provisional protection only.*)—"Improvements in raising and lowering boats and other "vessels from one water level to another, applicable in inland "navigation."

Upright shafts contain water, and in each shaft is a close hollow vessel (suitable to float boats within it); this vessel rises, by its buoyancy, to pass a boat from a lower to a higher

level, and sinks in the shaft to pass a boat from a higher to a lower level. The hollow vessel is closed at the top, and its ends can be opened and closed, to admit of the boats floating into and out therefrom when opened; the water contained by the vessel, together with the boat floating therein, when the whole arrangement is at the higher level, makes it specifically heavier than the water in the shaft, consequently the vessel descends from the higher to the lower level. In addition to the movable ends of the hollow vessel, "provision is made for "closing the lower part of the shaft so as to prevent water "passing therefrom to the lower level, and yet admit of the "passage of the boats or vessels brought down by the close "vessel in the shaft."

[Printed, 4*d*. No Drawings.]

A.D. 1859, September 29.—No. 2202.

STEVENS, Charles.—(*A communication from Yollet, Babin, and Gâche, ainé.*)—"An improved steam dredging boat."

This apparatus is a dredging machine, and also a "boat "capable of transporting its load to the place desired." The boat is divided into compartments, "the bottoms of which are "above water mark when empty, and in communication with "the sea by means of wells furnished with valves, on the "rising of which the mud of each compartment can be at one "and the same time emptied. A steam engine placed in the "boat moves alternately the shaft of the screw (by which the "boat is moved from place to place), and another shaft passing "beneath the mud compartments, and having at one end a "pinion gearing with two other wheels, each of which are "furnished with a crank pin on which a main connecting rod "is coupled, and which serve to move the balance beams to "which the connecting rods of the pump pistons are attached. "The bottoms of the pumps are in connection with suction "pipes by means of knee or joint pipes," permitting the wallower or core barrel of the tubes to be lowered by means of a windlass, to a certain depth, "for the mud is to be pumped "up above the water, and then when the vessel is loaded it "carries it off to the sea. Pipes or troughs are arranged so "that the mud runs into the different compartments. Thus "this vessel combines the two operations, that of dredging or "pumping up the mud, and the transporting of it to a con-

" venient place for emptying, where by means of valves it can " at once be discharged. The adaptation of movable suction " pipes forms the basis of the invention."

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1859, September 29.—No. 2203.

PAGE, George Gordon, and LUNGLEY, Charles.—" Im- " provements in gangways or step ladders applicable to float- " ing bodies and other useful purposes."

The treads or steps of the gangway always maintain their horizontal position, whatever may be the angle at which the step ladder may be placed. " And this is effected by attach- " to each end of each tread or step, either at the centre or " otherwise of its width, a pivot working in a bush or socket " upon which the tread or step is supported, and round which " it turns freely; also in attaching to each tread or step a " lever or arm, which is connected by a pin or stud to a rod, " bar, chain, or rope extending the whole length of the ladder " occupied by the steps, and to which every tread or step is " attached. One end of the rod, bar, chain, or rope is jointed " or similarly attached to the fixed part of the framing from " which the step ladder is suspended or to which it is other- " wise united. By means of this rod, bar, chain, or rope the " whole of the treads or steps are moved simultaneously in " the manner of a parallel ruler. The same object may be " attained by attaching two rods, bars, chains, or ropes to the " treads or steps by pins or studs in the manner of a Venetian " blind."

This step ladder may be applied under every variation or draft of water of the floating body. One of its applications is to landing piers.

The drawings show various modifications of the invention applied to a ship's side. In one instance, instead of independent pivots at each end of the steps, a continuous axis is used, having plates attached thereto to fix the treads thereon.

[Printed, 8*d.* Drawing.]

A.D. 1859, October 20.—No. 2404.

HODGSON, James.—" Improvements in building ships and " vessels."

One portion of this invention relates to dredging boats.

To enable bluff-ended ships to steer with facility the length of the vessel is increased "by applying thereto a triangular "formed chamber of sheet iron or steel, in such manner that "the base end of the triangular chamber may be bolted "or attached to the after or fore end of the very bluff or "squarish ended vessel." The rudder is hung to the after end of the triangular chamber. "In constructing bulkheads "of iron or steel plates in ships and vessels, in place of con- "necting their edges to the frames of the ships or vessels as "heretofore," the inventor forms "the edges of a bulkhead "double, in such manner that the plates of which the edges "of a bulkhead are formed may be placed at an angle to each "other, and spread out so that the edges of the two series of "plates may be rivetted to two of the angle iron or steel ribs "or frames of the ship or vessel, and such two-angle iron or "steel ribs or framings may be neighbouring ones or more "distant from each other; by this means there will be an "angular space enclosed around a bulkhead, which will give "stability to the ship or vessel as well as to the bulkhead."

[Printed, 6*d*. Drawing.]

A.D. 1859, November 2.—No. 2495.

BUDDEN, John Leggett.—(*A communication from Woodford Pilkington.*)—"Improvements in forming and driving piles "for the construction of piers, jetties, viaducts, bridges, or "or other works where piles are usually employed."

Piles are formed of iron bars, combined with a solid pointed shoe or foot, which is driven into the earth by means of an independent ram. "Each pile may be formed by combining "several of these rods or bars according as the piles are re- "quired to be of triangular, square, or polygonal form. The "ends of the piles where they enter the ground are formed by "bending the lower end of each rod employed to form the "pile, and drawing it to a point; the cluster of rods forming "the pile being kept in shape at the point by welding or by "fixing the points in a 'shoe,' or by ring ferrules driven over "the ends of the rods and piles constructed as above de- "scribed, may for distinction be termed 'solid footed skeleton "'piles.'"

In driving a pile of the above description, "a solid foot is "placed in the conical part of the bottom of the pile where "the rods or bars are bent and tapered towards the point;" this foot is made of hollow cast iron or of hard wood, and receives the blow of the monkey. A ram fits in between the bars and communicates the driving force from the monkey to the foot; it is removed when the driving is completed and a centre bar is substituted, so that the whole pile is adapted to receive the weight of the superstructure, being made rigid for that purpose, by metal discs, combined with keys. If required the piles may be lengthened.

This invention is applicable to form piles on rocks where ordinary piles cannot be driven, holes being bored in the rocks of suitable depth to receive the ends of the rods or bars separately. The upper part of the pile is completed by connecting the rods as set forth above.

[Printed, 10d. Drawing.]

A.D. 1859, December 5.—No. 2754.

HUTTON, WILLIAM. — "Improvements in preventing the "destruction of the timbers of piers, docks, and other structures by the action of sea worms, or other marine animals."

The wood is placed in a close vessel which is then exhausted of all moisture and air; it is "then saturated or impregnated "with any of the following substances, namely:"—1st. Carbonate of lime, formed by employing a solution of caustic lime, and then submitting the timber to the action of carbonic acid gas. 2nd. Sulphate of lime, formed by the application of sulphuric acid after the solution of caustic lime. 3rd. Sulphate of iron followed by an alkaline solution. 4th. Soluble silex or water glass and the further application of chloride of calcium solution.

The external surface of the wood may be smeared with the materials, or the wood may be immersed in a bath of the same, or the materials may be forced "into the exterior pores "of the wood by atmospheric or mechanical pressure, the "wood being placed in a receiver and exhausted of all moisture and air; this latter method being preferable on account "of the greater penetration thereby obtained; or if a more "complete saturation and lapidification of the wood be

" desired, the solutions may be forced into the wood end-" wise or longitudinally by means of hydraulic, atmospheric, " or mechanical pressure."

[Printed, 4d. No Drawings.]

A.D. 1859, December 6.—No. 2757.

COIGNET, François.—" Improvements in the manufacture " of beton or composition applicable for purposes of cover-" ing, building, and construction, and for various uses, as " artificial stone."

To obtain the lime in the beton in a desirable condition, it is partially slacked, the slacking being completed by grinding it with a very small quantity of water before adding any other ingredient. Sandy matters, before being added to the lime, are dried by means of heated air, or the excess of moisture may be extracted by combination with puzzolanos, cinders, or other absorbents. Cements may be combined with the above substances. The ingredients when united are subjected to an excessive mixing and pressing operation effected by machinery until the composition is in a plastic and homogenous condition. " Earth may, in certain cases, be combined with the lime, " double-headed nails, or other irregular fragments or pieces " of iron may be introduced in the body of the composition as " additional binding agents."

These betons are applicable for constructing sea walls, embankments, and other works exposed to the waves; also to dams, dykes, locks, piers, and other water works as well as to lighthouses. A state of the substance is obtained resembling potters' clay or loam which is applicable to impervious hydraulic works and is an important characteristic of this invention.

[Printed, 6d. No Drawings.]

A.D. 1859, December 8.—No. 2782.

FOORD, John Ross.—" Improvements in applying travellers " or lifting engines to barges or other craft, for drawing piles, " raising sunken craft, moorings, and other such like pur-" poses."

According to this invention, a traveller is mounted upon rails that are placed longitudinally upon bearers. By this means the lifting engine can travel to and from the midships

of the barge or vessel, and be brought and retained directly over the pile or body which is to be raised. The rails and bearers project over one end of the vessel, whilst the other end of the vessel "when about to lift a pile or other body is "weighted or more deeply immersed in the water by weights "ballast applied at that end."

The drawings show the machinery to be in the act of commencing to raise a pile, which is embraced by a short chain, to which is attached the block of the lifting chain.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1859, December 30.—No. 2987.

ROBERTSON, WILLIAM.—"A new method of dragging boats "by the power of the water passed through canals or rivers, "or otherwise attainable."

1st modification.—A water wheel or turbine receiving its water from a lock, or otherwise, gives motion to a chain or rope passed over pulleys "distributed along the banks between the locks." To the said chain or rope "is fastened "one end of a short rope, whose other end is made fast to the "boat, so that the boat is thereby moved, or a boat may be "kept constantly attached to the rope or chain moved by the "wheel, and the boat to be dragged may be attached to it in "the usual way."

2nd modification.—A flexible pipe is fastened to one end of the conveying pipe fixed in one lock, and is passed "along the "bottom of the canal to the next lock, when it is attached to "the end of another pipe similarly fixed with the above to "the lock." "This flexible pipe is passed between a pair of "rollers fastened in suitable framing on the deck of the boat "to be dragged, and as the water is admitted into the pipe it "will be expanded between the rollers and force them along, "and, of course, the boat on which they are fastened will be "forced along with them. As in the preceding method, the "rollers may be placed in a suitable framing fastened on the "deck of a small boat, and the boat to be dragged may be "connected to this small boat in the usual way. The rollers "may be fastened in framing under the boat, and the tube "passed between them, or a twin boat may be constructed, in

"the middle of which a framing for the rollers may be put, "through which the flexible tube may be passed, and the "water utilized."

[Printed, 10*d*. Drawing.]

1860.

A.D. 1860, January 28.—No. 225.

SAVAGE, Robert Watson.—(*Provisional protection only.*)— "Improvements in tidal ladders, and in steps for embarking "and landing purposes."

"This invention consists in so forming a ladder or steps that "the step pieces shall be secured upon pivots or upon a moving "bar or bars beneath the same, such pivots, or the ends of "such bar or bars, moving to and fro in suitable bearings "in the side framing to which the step pieces are secured, "from which side pieces proceed levers, which are secured to "the ends of the pivots, or the bars beneath the step pieces, "such levers being secured at top to another side framing by "the like moving joints, and above this the upright rails and "hand rails of the ladders or steps are placed, the effect of "which arrangements will be, that as the ladder is drawn out "straight to form a level gangway, the step pieces will be all "level, forming the flooring of the same; and when, by the "falling of the tide or otherwise, the outer end sinks down, "the step pieces will then take positions proper to the steps "of a ladder or stairs, by turning on their pivots or centres "aforesaid; and it is evident that modifications of the above-"described arrangements may be used to effect this object."

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 2.—No. 580.

EDWARDS, George.—"Improvements in caissons and foun-"dations for bridges, piers, and other structures under "water."

This invention "consists in the use of a caisson, with a "bottom of sufficient strength to carry the required super-"structure; such bottom having formed in it a number of

" holes corresponding with the number of piles intended to " be driven or worked into the ground, such holes being also " of the size of the piles in their cross section. The holes or " sockets for the piles are provided with stuffing boxes packed " with an india-rubber ring, or other elastic packing, to pre- " vent the water from entering the caisson, which is thereby " rendered water-tight."

In some cases, piles screwed throughout are used; the holes or sockets then have an internal screw formed in them, " so as " to form the nuts for the piles; and when the ordinary piles, " or those with a screw only at the point for passing into the " ground are used, the said holes or sockets need only be cast " cylindrical.

"The caisson may be made in water-tight compartments, in " order to facilitate the sinking of the same to its required " depth by letting water into some of these compartments, " while the remainder are empty. Bnt the caisson may be " otherwise constructed, and sunk to its required depth."

There are levelling discs with shafts, guides, and screws. These serve to keep the caisson level before and during the driving of the piles.

" In some cases the caisson may be closed at the top in order " to admit of the employment of compressed air for driving " the piles."

[Printed, 10*d*. Drawing.]

A.D. 1860, March 3.—No. 593.

MUNTZ, William Henry.—" Improvements in the construc- " tion of ferry boats."

These ferry boats are built with flush decks, so as to accommodate horses, carriages and cattle without interfering with the passengers.

The part of the invention which entitles this Specification to be included in the present series of Abridgments, relates to a floating dummy, by means of which the communication with the shore is made.

The deck of the floating dummy " is about the same level " as the flush deck of the ferry boat, so that horses, carriages, " and cattle can be driven on or off the latter with great " facility. The 'dummy' is attached to the pier or landing, " and rises and falls with the tide."

[Printed, 8*d*. Drawing.]

A.D. 1860, March 8.—No. 631.

BIRKBECK, George Henry.—(*A communication from William Wain.*)—" Improvements in floating docks."

These structures may be used to raise vessels out of the water, or to build them and lower them into the water. " The " sides of the floating dock are formed hollow and in com- " partments with spaces or openings through them at inter- " vals. The sides are formed on or connected with longitudinal " hollow bottoms or bases of larger sectional width than the " sides, and the sides of the dock above the bases are at all " times filled with air."

" When the dock is sunk to its lowest position, the upper " portions of the hollow sides are then above the surface of the " water, and form a gangway for the necessary operations to " be carried on, and upon which the necessary apparatus, such " as steam engines, crabs, cranes, and pumps are fixed to " assist in conducting the various operations required in con- " nection with the dock. The compartments of the bottom " are furnished with suitable ingress and discharge valves, " and with pipes, and stop-cocks in connection with the hollow " sides into which air is forced by suitable pumps, and the " pipes and stop-cocks in connection with the several series of " compartments in the bottom are so arranged that any par- " ticular series of compartments may be filled or discharged " at pleasure so as to facilitate the placing of the dock in any " desired position or at any angle that may be required, and " docks of this construction will be found to be very convenient " for hauling ships or vessels up inclines, or on to slips, which " may be of a temporary or permanent character, the engine " power employed for pumping being readily adapted to suit- " able apparatus for hauling up the vessel."

[Printed, 1*s*. Drawings.]

A.D. 1860, March 22.—No. 746.

RENNIE, George Banks.—" Improvements in the construc- " tion and mode of working and employing floating platforms, " pontoons, or docks, for supporting ships or other vessels."

This invention " consists in constructing an iron water-tight " hollow platform of a rectangular or other convenient form, " of a depth and capacity suited to the purpose for which it is

" intended, and in the division of such hollow platform by " longitudinal and transverse bulkheads into any convenient " number of parts or chambers." By means of valves, water may be admitted into or let out from one or more of the chambers, so as to level the base of the dock. The weight of the ship that is raised by the pontoon is distributed thereon by means of balks of timber and suitably-placed girders and girder frames. Steam power is placed on the top of the side walls or hollow chambers to work pumps, &c. By means of pipes and valves, each chamber can be independently acted upon by the pumps.

"In such floating platform, pontoon, or dock, fixed or " moveable ends or gates or caissons for the purpose of " enclosing the vessel can be dispensed with, and are not " needed."

In addition to the plate iron or plate steel bulkheads, the pontoon as well as the side walls are strengthened by means of open or lattice girder frames formed of diagonal iron or steel braces and trusses, "and similar iron trussings are " applied in a longitudinal direction, and diagonal iron frames " are introduced between each system of girder frames to " strengthen the iron plating."

[Printed, 10*d*. Drawing.]

A.D. 1860, March 28.—No. 805.

SMITH, Stephen Randoll.—" Improvements in vessels and " apparatus used for raising sunken vessels and other bodies " in the water, and for lowering materials for structural pur- " poses in the water."

These improvements are, for the most part, improvements on the invention described in No. 785 (A.D. 1854).

For lowering the said materials, two floating vessels are employed; these vessels have hydraulic machinery for working chains that pass through vertical trunks in the said vessels. In No. 785 (A.D. 1854) windlasses were used to work the chains.

To each trunk, two or more hydraulic cylinders are applied, one or more on each side of the trunk. Cross heads connect the rams of each pair of cylinders. To the middle of each cross head a rod is attached, having at its lower end an instrument for taking hold of the cable used. The formation of the hold-

ing apparatus admits of its being lowered down the cable, "and then to take hold thereof before the pumps are put in "motion to actuate the rams in the hydraulic cylinders."

All the hydraulic cylinders are connected "to a common "supply pipe of suitable dimensions, into which the water to "supply all the cylinders is pumped, and on the branch pipe "which connects each hydraulic cylinder with the supply "main there is a cock or valve, by which the supply of water "to each hydraulic cylinder may be regulated or shut off, and "there is also an outlet pipe and cock or valve, which com-"municates with a common outflow pipe." "When the ram "has arrived at its highest point, a way is opened for the "escape of any water that may be pumped in."

[Printed, 1s. 6d. Drawings.]

A.D. 1860, April 16.—No. 950.

MUNTZ, WILLIAM HENRY.—(*Letters Patent void for want of Final Specification.*)—"Improvements in the construction of "floating piers."

"The invention consists principally in so constructing the "pier as to form a breakwater on each side of the boat or "vessel (whilst she is floating and unloading), projecting at "right angles, or nearly so from the quay or shore. This "part of the floating pier consists of two planked gangways, "one on each side of the vessel, supported upon floating tanks "which are linked together with chain cable or long links, "and connected to the quay or to the shore by means of a "planked flap or gangway hinged thereto. This hinged flap "or gangway, which is the full width of the whole pier, allows "of the floating pier rising and falling with the tide, and "forms a level or inclined connection between the floating "pier and the quay or shore, according to the state of the "tide.

"The floating tanks are protected from damage by driving "in two or more piles on each side of each tank, so as to allow "the tanks with the platform or gangway on them to rise and "fall with the tide between the said protecting piles.

"It will thus be evident that at all states of the tide droves "of cattle, horses, and carriages can be embarked and disem-"barked over the end of the ferry boat or vessel, whilst the "passengers can land or embark over either or both sides."

The ferry boat preferred to be used in connection with this invention is described in No. 593 of the year 1860.

[Printed, 4*d*. No Drawings.]

A.D. 1860, April 18.—No. 979.

NEWTON, William Edward.—(*A communication from F. Maxwell Lyte.*) — (*Provisional protection only.*) — "Improved "means of illuminating buoys, finger or direction posts, mile-"stones, or other marks used at sea or on land to guide or "direct navigators or travellers, so as to render such buoys, "posts, or marks visible at night."

This invention consists of the application to the above purpose of sulphide of calcium commonly known as Canton's phosphorus, sulphide of barium, or other bodies that derive their luminosity from the absorption of solar light. "Canton's "phosphorous, for example, shines with a light which is not "visible in moonlight, but is so in complete darkness at fifty "yards to the naked eye, if the containing vessel be about the "capacity of a gallon."

[Printed, 4*d*. No Drawings.]

A.D. 1860, April 23.—No. 1013.

BROOMAN, Richard Archibald.—(*A communication from Francis Charles Vannet.*)—(*Provisional protection only.*)—"Im-"provements in buoys."

"This invention consists in affixing horizontally to an iron "rod projecting from the top of a buoy, constructed as here-"after described, one or more discs or balls to act as a beacon "or signal. The buoy is of the form of a double cone, and is "constructed in two sections, the lower of which, or actual "buoy, is of course water-tight; the upper section is hollow "and has a hole in its apex, through which the iron rod to "which the discs or balls are attached projects. This iron rod "is suspended from or attached to the apex of the buoy by "gimbals, and has attached to its lower end within the "hollow section of the buoy a ball of sufficient weight to keep "the iron rod always in a perpendicular position in rough or "troubled water, whatever be the position of the buoy."

[Printed, 4*d*. No Drawings.]

A.D. 1860, April 28.—No. 1084.

GRANTHAM, John.—"Improvements in slips for raising "ships and vessels."

"This invention consists in applying a worm wheel and "screw to drive the main shaft on which the drum used for "moving the chain is applied, in substitution of spur wheels "heretofore interposed between the first mover and the main "shaft."

The drawings show a machine with side frames and two steam cylinders that give motion to a horizontal shaft on which are loose bevil wheels, either of which can be acted upon by a clutch. These wheels rotate the vertical shaft on which is the screw which works into the worm wheel on the drum shaft. The drum moves the pitched chain that works the cradle on which ships are placed to be hauled up. A surging pulley is placed on the horizonal shaft.

[Printed, 10*d.* Drawing.]

A.D. 1860, May 1.—No. 1100.

NEWTON, Alfred Vincent.—(*A communication from Horace Irving Crandall.*) — "Apparatus for lifting vessels out of "water."

"The invention consists in combining with a suitable plat-"form or staging, furnished with bilge and keel blockings "and braces for keeping the vessel in an upright position, a "suitable number of columns upon which the cradle is sup-"ported, the said columns being jointed at their ends to the "cradle and to base timbers, and made capable of swinging "to and fro, while at the same time they keep the cradle in "a horizontal position whatever be the inclination given to "these columns or supports. By this means the cradle may "be let down into the water below the line of the vessel's "bottom, and when the vessel is floated over it, the cradle "may be elevated with a forward movement until the columns "are in a vertical position; the columns will then serve as "permanent supports, so that the vessel will not rest upon "or be supported by the lifting power."

In raising a vessel, when it is floated over the submerged cradle and secured thereon, a steam engine or other motive power winds up the chains attached to the cradle on wind-*lasses, and* thus elevates the vessel. The cradle is then made

fast, so that it cannot swing back. "The same operation " reversed will launch the vessel again into the water with " speed and great efficiency."

[Printed, 8*d*. Drawing.]

A.D. 1860, May 16.—No. 1203.

GRANT, John.—" Improvements in breakwaters."

This invention consists " in forming a breakwater of any " required number of apparatuses, constructed as hereafter " described. Each apparatus is formed of a frame made to " carry a number of louvre boards or plates; the main part " of the frame is composed of two beams brought close to- " gether at that part which is to become the bottom of the " apparatus; as the beams are carried upwards they diverge, " and make a conical-shaped frame; the louvre boards or " plates are fitted at an angle into and across the beams. The " beams have fixed on them buoys to increase or ensure their " buoyancy. Each separate apparatus is moored to a screw " pile or other mooring by its lower end; the upper end " carries one or more projecting pins or studs, and iron rods " formed at both ends with eyes, are passed over the studs, " connect the apparatuses to each other, prevent their coming " in contact, and unite any desired number of the apparatuses " into a complete breakwater. Each apparatus floats verti- " cally, or at a greater or lesser angle to the horizontal line, " and is partially submerged. Each of the apparatuses is " capable of independent play, and the waves striking against " the louvre plates are broken, and the water becomes com- " paratively still inside of the breakwater."

[Printed, 6*d*. Drawing.]

A.D. 1860, May 21.—No. 1244.

CROMPTON, Samuel, and ROBERTSON, William.—(*Provisional protection only.*)—A " method of economising water " passing through canals when such water is used for dragging " boats or otherwise."

The object of this invention is to restore a portion of the water passing through the locks of canals or otherwise, from a lower to a higher level. For this purpose pumping machinery

is used, "which is worked at each lock or overflow, the water "thus raised at intervals being used as constant power to "drag boats," as set forth in No. 2987 (A.D. 1859), or for any other purpose where moderate power is required. "There "are two modes by which the power obtained from the water "thus restored from a lower to a higher level may be utilized; "one of these modes being by water wheel or turbine and "windlass, and the other by means of a flexible expanding "pipe passing between rollers attached to the boat to be "dragged." The advantages of the present invention are, "that the power obtained may be extended over a longer "period, and can be more easily controlled, and the machi-"nery employed may be placed in any convenient position, "without reference to the position of the locks; or the "water thus restored may be used for canal purposes, whether "for increasing the traffic or economising the water."

[Printed, 4*d*. No Drawings.]

A.D. 1860, May 23.—No. 1283.

DE BOUSSOIS, FRANÇOIS JOSEPH EDOUARD DUCLOS.—(*Provisional protection only.*)—"Improvements in the treatment of "bituminous rocks for the extraction of bitumen therefrom, "and in the application of the residuum to various useful "purposes."

To extract bitumen from calcareous rocks, when it is combined therewith, the rock is broken by mechanical power or reduced by muriatic acid solution. When the whole of the calcareous portion of the mass has been destroyed, the bitumen which remains is washed, and then melted and treated in the ordinary manner.

"When bitumen is found in quartzy, siliceous, or alu-"mineous rocks," the material is reduced by grinding, stamping or otherwise, and then submitted to a heat sufficient to melt the bitumen. The melted mass is then introduced into moulds and subjected to pressure, so as to express the surplus bitumen, "leaving a sufficient amount remaining "to impart to it a degree of elasticity, tenacity, compactness, "and hardness, which will render it peculiarly well adapted "to the construction of hydraulic works, roads, and other "fabrications where strength and durability are essential."

"Another mode of treating these last-mentioned rocks or "substances consists in placing the reduced fragments in "conical receptacles provided with outlet pipes for the escape "of the fluid bitumen, and furnished with suitable appliances "for the introduction therein of a current of heated air or "gas; a current of oxyde of carbon, carbonic acid, and azote, "obtained from the ordinary combination of fuel, is found to "answer well."

[Printed, 4*d*. No Drawings.]

A.D. 1860, June 20.—No. 1496.

WEBB, EDWARD BRAINERD.—"Improvements in breakwaters "and piers."

The said breakwaters and piers "are composed of bars, rods, "or pipes of wrought or cast iron, or of chains or links of "wrought iron affixed to or between girders or frames of "wrought or cast iron or wood, and supported on piles of "wood or of wrought or cast iron, or in or on frames of wood "or iron. The structure is intended to present to the action "of the waves an inclined, vertical, or curved face formed "by the bars, rods, pipes or links, which are arranged in "horizontal, inclined or crossed, single, double, or multipli-"cate series. When required a certain number of the piles "or portions of the frames are to be carried up from or "through the structure so as to support a platform which "may be used as a pier. The mode of fastening the bars, "rods, pipes, or chains to the girders, frames, or piles may "be varied. When the base is a deep stone embankment, and "piles are unsuitable, main frames (supporting the girders "or frames which contain or in which are fixed the bars, "rods, pipes, chains, or links) may be fixed to chairs em-"bedded in the body of the embankment, or to blocks of "stone or logs of timber similarly embedded. When the "base is of solid rock, and there is no embankment, the depth "of water being suitable, then the main frames or their "chairs (or the feet of piles, if such are used) may be fixed "directly to the rock itself. In some cases it may be de-"sirable to insert pipes or bars with wings, and moveable "in the girders or frames."

[Printed, 2*s*. 4*d*. Drawings.]

A.D. 1860, July 3.—No. 1612.

DURAND, François. — (*Provisional protection only.*)—" An " improved mode of purifying the Thames and other tidal " rivers."

For this purpose a canal is constructed from the river to the sea, " the river end of it being at or near the city or " town, or the drainage discharge, or so situated as to carry " off the sewage and fecal contents of the river in the manner " herein-after described, preferring to have it at that part " into which the largest quantity of sewage is discharged. " This canal is to be provided with sluice gates, locks, or a " suitable gate or gates at both ends. When the tide rises " (supposing the canal empty), the sea end lock or gate of the " canal is closed, and the river end lock or gate opened, and " as the tide rises the river water driven back by the tide will " be impelled into the canal, carrying with it the sewage and " foul matters with which it is charged. When the tide is up " to high water the river gate is also closed, when the tide " has gone down to low water the sea gate is opened, the " river gate still remaining closed, so that the contents of " the canal will be discharged into the sea. The canal may " open at its river end into two or more points of the river, " or, what is the same thing, two or more branches may lead " from the river into the main canal, each branch having " its lock gate or gates opening and closing as before de- " scribed. The canal may serve for navigation purposes if " desired."

[Printed, 4*d*. No Drawings.]

A.D. 1860, July 4.—No. 1621.

DOULL, Alexander. — " Improvements in excavating or " clearing away earth, sand, and other substances prior to " forming foundations under water and otherwise."

When excavating for a foundation in the inside of a cylinder, or for a continuous foundation protected by piles or otherwise, the inventor employs a frame or ladder of iron or wood, which is placed vertically over the ground to be excavated, and which is attached to a travelling platform or fixed in any other convenient manner. To this ladder is fitted a chain carrying at convenient intervals a series of small buckets or excavators, *the form* of which is modified according to the nature of the

ground to be excavated. "The chain carrying the excavators "is passed over a friction roller or sheave fixed at or near "the bottom of the frame or ladder." At a convenient height upon the ladder the inventor fixes a projecting frame or head with a roller or sheave, over which the chain carrying the buckets passes. "This projecting head is for the purpose of "carrying the buckets clear away from the ladder, to admit "of the excavated materials falling from the buckets at their "upper turning point into a receptacle provided for them. The "chain is caused to rotate by any convenient means, and the "motion of the travelling platform brings the excavators to "every part of the ground to be excavated."

The Provisional Specification describes an apparatus which consists of an auger or screw passed through a bucket. On the screw being rotated, it excavates the ground, "and raises "the portions acted upon into the bucket."

[Printed, 6*d*. Drawing.]

A.D. 1860, July 12.—No. 1677.

GIBBS, JOSEPH.—(*Provisional protection only.*)—"Improve-"ments in constructing submerged works."

"This invention is for an improved method of constructing "breakwaters, harbours, piers, jetties, bridges, forts, defences, "and other works under water level by means of cassoons "formed of distinct water-tight cells, which may be floated "to the proper site, and sunk by admission of the water, and "the cells afterwards separately emptied of water, and filled "with concrete or other permanent building material, and "also by means of a cylinder coffer-dam wider at the bottom "than at the top."

In one plan the caisson is made as above of wrought iron, and stayed with stays. These caissons may be joined so as to enclose any given area which may be filled with rubble, and on which the superstructure may be raised.

These caissons may also be constructed of brick or stone, and deposited in their places by a transporting caisson. The latter caisson is cellular, and is provided with sluices "so that "the tidal water may flow in and out of it;" it is also supplied with two powerful latticed girders. A bulge on the stone caisson rests on the sides that are re-entrant in the

transporting caisson, and, the sluices being closed, the flow of the tide lifts the whole, and the stone caisson may be deposited where wanted; for on filling the cells of the transporting caisson with water it sinks, and, being jointed, separates from the stone caisson, and may be raised by the displacement of water by air.

The cylinder coffer dam has an outside case of iron; "the "lower edge is constructed sharp for penetration."

[Printed, 10*d*. Drawings.]

A.D. 1860, August 21.—No. 2013.

CAMPBELL, JAMES.—"Improvements in apparatus for re-"moving sand or mud from the bottom of the sea, and of "rivers, docks, and harbours."

This invention "consists in the combination of a rotary "agitator or scarifier with hydraulic pumps applied to steam "vessels, in such a manner as to by driven by a steam engine "or other mechanical power separate from and independent "of the engine or engines for propelling the vessel. For this "purpose the agitators or scarifiers (the number and form of "which may be varied) are mounted on axes fitted in a frame "suspended from the driving shaft of the independent engine, "so as not to interfere with the working of the shaft. The "ends of the shaft carry pulleys, over which pass endless "chains for turning pulleys on the ends of the axis of the "agitators. The said driving shaft is also made to work the "pumps on board of the vessel, from which water is forced "through pipes leading to a chamber suspended from the "frame of the agitators, and thence through outlets from the "chamber, so as to act on the sand, mud, or earth turned up "by the agitators or scarifiers; and in combination there-"with to remove the same as required."

[Printed, 10*d*. Drawing.]

A.D. 1860, August 30.—No. 2099.

NEWTON, WILLIAM EDWARD.—(*A communication from Thomas Schofield and Robert Schofield.*)—(*Provisional protection only.*)—"Improvements in floating structures."

"The object of this invention is to produce a floating struc-"ture on which the platforms or roadways of bridges, light-

"houses, piers, landing stages, and other structures may be "supported above water in places where the depth of the "water does not allow of the application of the pillars or fixed "foundations commonly used for such structures.

"The invention consists in the employment for the above "purpose of a series of hollow globes or cylinders, which are "steadied by balance weights of a peculiar construction, and "which are secured to the ground by suitable chains and "anchors. These hollow globes or cylinders are also fur-"nished with arms or standards which extend upward for the "purpose of supporting the roadway, platform, or other "structure to be erected above water. The hollow globes or "cylinders are also provided with valves and pumps for "removing the water which may find its way into the interior "of the globes or cylinders."

[Printed, 4*d*. No Drawings.]

A.D. 1860, September 18.—No. 2270.

MILLER, Daniel.—"Improvements in the mode of con-"structing breakwaters, piers, quays, sea walls, and the "submarine works of fortifications."

One part of this invention consists in putting down guide piles, frames, or standards, in line of the face of the structure which is to be built. On these guides, blocks of stone to form the face of the structure, having holes, &c., to correspond with the size and shape of the piles, &c., bored through them are threaded over in succession. The facing thus formed may be backed up by concrete or otherwise, so as to form a solid structure.

Another mode of constructing these works, described in the Specification, "is by building them in sections in a caisson "or box forming a kind of coffer dam, the sides of which are "formed of a number of distinct frames or divisions. These "frames or divisions are constructed so as to be easily "removeable after a section of the work has been completed "within it, and then put together again, and by thus reform-"ing the caisson to enable another section of the work to be "built within it."

Increased rigidity may be given to these structures by placing the guide standards nearer together, and forming two

openings in each block of stone. "The blocks are made to "break bond with each other."

[Printed, 1s. Drawing.]

A.D. 1860, September 21.—No. 2307.

CAMPBELL, James.—"A chambered floating dry dock."

This invention "consists in the construction of floating "docks with the base composed of water-tight chambers so as "to afford the required degree of buoyancy to the dock, such "chambers being separated from each other by water-tight "partitions, in order to prevent the stability of the dock from "being endangered by any excessive rolling of the water "internally, and also to prevent its safety from being endan-"gered by the external plating of one or more of the chambers "becoming injured so as to admit the water from without. "The upper chambers which form the sides of the dock are "only intended to give it stability when the lower chambers "(on which alone in ordinary cases its buoyancy depends) are "immersed. The upper chambers are separated from the "lower by a water-tight deck over which the water is allowed "to flow through regulating valves in or out according as the "dock is being lowered or raised. In most cases it is pre-"ferred that the upper chambers should not be continuous, "but formed by means of rectangular towers or vertical pro-"jections, for instance at each corner of the various sections. "The engine and pumps for withdrawing the water from the "lower chambers being contained in a small water-tight "portion of such upper chambers, the remaining portion of "the same allowing free ingress or egress to the water during "the lowering or raising of the dock."

[Printed, 1s. 2d. Drawings.]

A.D. 1860, October 2.—No. 2377.

MACNAMARA, Bamfyeld Henri Francis.—"Improvements "in the construction of floating breakwaters adapted for the "facile and economic formation of harbors of refuge, and "other such purposes."

Large enclosed hollow cylinders or pontoons are floated and moored end to end, "and linked together in a line with their "axes with a strong coupling, fitted with a large iron drum

" keyed on a strong axis provided with friction rollers let into " the outer edge, so as to reduce to the minimum the wear of " the mooring shackles and to facilitate rotary motion in the " said pontoons." The pontoons are divided into water-tight compartments. The axis of the pontoon works in a chamber fixed in the end of the pontoon and provided with vulcanised india-rubber packing. By means of a water-tight pipe through the centre of each pontoon and a chain passing therethrough, a continuous line of pontoons may be formed. The pontoons carry a diagonal cradling furnished with friction rollers. One or more tiers of piles are suspended from the cradling; these are braced together by link joints. In some cases inclined planes of wood or iron are fitted on the outer mooring cables.

These floating breakwaters are to be placed in one or two lines. The outer line, only, is provided with inclines, and a platform between the two lines may be used as a wharf or parapet.

[Printed, 10*d*. Drawing.]

A.D. 1860, December 20.—No. 3132.

RENNIE, George Banks.—" Improvements in machinery, " apparatus, and works of construction, intended to be em- " ployed and the mode or method of using or employing " the same for the purpose of examining or repairing ships " and other vessels."

Employing a floating dock in raising and lowering ships in connection with rails fixed thereon and other rails arranged upon a wharf, a carriage being used to receive the vessel and to place it in a convenient position on the wharf. The floating dock is thus left at liberty for other uses.

A water space or shallow basin is excavated with a level bed, so as "to admit freely the pontoon or floating dock " carrying the vessel." When the pontoon is floated into the basin and the gates thereof closed, the pontoon is allowed to sink on to the level bed; its rails are then brought into correct position with those on shore and the carriage (with the ship upon it) is moved from the pontoon to the required position on shore. The floating dock can then be undocked to receive another ship to be repaired or it may receive a vessel which has previously been repaired.

To close the entrance to the above and other basins or docks a caisson of a peculiar form is employed. A hollow framed or cellular structure is made of a form suitable for closing the opening, so as to fit into grooves in the cell and side walls. The thickness of the caisson has a parabolic shape, and on each side at the top of the structure is a half boat-shaped hollow vessel; the upper and lower portions have each sluices and valves.

Hydraulic pumps, combined with a portable steam engine, and other apparatus are used to haul the carriage carrying the vessel.

No. 746 (A.D. 1860) is alluded to in this Specification.

[Printed, 1s. 4d. Drawings.]

1861.

A.D. 1861, January 12.—No. 93.

GIBBS, JOSEPH.—"Improvements in constructing submerged "works."

"This invention is for an improved method of constructing "breakwaters, harbours, piers, jetties, bridges, forts, defences, "and other submerged works under water level by means of "cassoons formed of distinct water-tight cells, which cassoons "may be floated to the proper site, and sunk by admission of "the water into them, and the cells may be afterwards sepa- "rately emptied of water, and filled with concrete, or other "permanent building material." These caissons may be joined so as to cover any requisite area, or they may be made to enclose an area, which may be filled with rubble and on which the superstructure may be raised.

A cellular transporting caisson may be used to deposit the brick or stone caisson in its place. The transporting caisson divides into two parts, it is provided with sluices to each cell, and has two powerful latticed girders to keep the two parts in line with each other. A bulge on the caisson to be deposited rests on the re-entrant sides of the transporting caisson, the sluices of the latter are shut, and the flow of the tide then lifts the whole; the stone caisson may thus be deposited on its

intended site. By filling the cells of the transporting caisson, it will sink, deposit the stone caisson, and free itself therefrom by dividing into two parts; on air being pumped in, it will rise and be free to transport other structures.

A cylindrical cellular coffer dam is used for the foundations of piers, &c.; its outside iron case is wider at the bottom than at the top; the lower edge has a sharp angle, so as to fit it for penetration.

In building a sea wall, a caisson open at one end is employed.

[Printed, 10*d*. Drawing.]

A.D. 1861, February 11.—No. 341.

NEWTON, William Edward.—(*A communication from Thomas Schofield and Robert Schofield.*)—"Improvements in floating "structures."

"The object of this invention is to produce a floating structure on which the platforms or roadways of bridges, lighthouses, piers, landing stages, and other structures may be supported above water in places where the depth of the water does not allow of the application of the pillars or fixed foundations commonly used for such structures.

"The invention consists in the employment for the above purpose of a series of hollow globes or cylinders, which are steadied by balance weights, which are secured to the ground by chains and anchors. These hollow globes or cylinders are also furnished with arms or standards which extend upwards for the purpose of supporting the roadway, platform, or other structure to be erected above water. The hollow globes or cylinders are also provided with valves and pumps for removing the water which may find its way into the interior of the globes or cylinders, so that their buoyancy may be maintained."

[Printed, 8*d*. Drawing.]

A.D. 1861, February 28.—No. 520.

ROSE, William, and CROWDER, Thomas.—"Improvements "in apparatus employed for raising and supporting ships and "vessels."

According to this invention, the hollow platform generally in use for raising vessels is caused to sink and rise horizontally, however unequally the platform may be loaded.

The apparatus preferred to be employed in combination with the platform "and on either side and end thereof" is similar "to what is employed in constructing a parallel rule." A wooden bar has several links (all of the same length) attached to its under side by joints and also jointed to the bottom of the dock. The upper side of the bar has similar links similarly jointed to itself and to the platform. The platform will thus sink and rise parallel to the surface of the water.

"In place of using parallel links or rods, as above explained, " a series of endless chains may be employed, each chain pass- " ing round two chain wheels on parallel axes, the one axis " being at or near the bottom of the water, and the other above " the water, so that one chain cannot move faster than the " other chain, and by using two such axes with their chain " wheels and chains at each side and at each end of the plat- " form the same may be caused to sink and rise parallel with " the level of the water."

[Printed, 10*d*. Drawing.]

A.D. 1861, March 19.—No. 691.

CHALMERS, JAMES.—" Improvements in constructing road- " ways under water."

This invention "consists in submerging tubes of suitable " dimensions and construction, in place of having recourse to " tunnelling as heretofore."

The tubular roadway may be of circular cross section having a rectangular way formed therein. Each length has a partition to resist the pressure of the water when the said length has been submerged and subsequently emptied of water. Each end of a length has inner flanges as well as an outer flange.

A submerged tower enables the roadway to be commenced at a point intermediate between the banks of the river or sea, " provision being made for connecting the ends of the tubular " ways on opposite sides of the tower in like manner to that " in which the ends of the lengths or sections of the tubular " way are connected end to end when they are submerged."

"The lengths or sections of the tubular roadway are in succession floated out to the positions they are to occupy, and "are then submerged and coupled up." The water used in submerging each section, "is allowed to flow from it into the "sections previously submerged, and thence to the tower "where the water is raised and pumped away." To have a clear way through the sections, between the tower and the length next to the one last submerged, the partitions are removed as the work proceeds, the outermost partition remaining till another length has been submerged and coupled up. To prevent the lengths from floating when they are empty, each section is formed with hollow chambers that may have a quantity of stones deposited therein.

[Printed, 10*d*. Drawing.]

A.D. 1861, April 26.—No. 1053.

STRANGMAN, Edward.—(*Provisional protection only.*)—"An "improved system of building or construction applicable to "architectural and other similar purposes."

This system "is applicable to the building or construction "of quays, docks, piers, harbours, breakwaters, lighthouses, "and other structures, either wholly or partially under water," "and may also be used as a substitute for concrete or piles, as "a foundation for buildings on marshy or boggy land, and in "other places where an artificial foundation may be required.

"The invention consists in the substitution for the masonry, "brickwork, or other material usually employed for such "purposes of hollow boxes or cells of cast iron bolted together "by their sides, such boxes or cells being of a rectangular, "hexagonal, octagonal, or other suitable form, and being "either cubical, or of any depth or thickness in proportion to "their diameter or superficial area as may be required to give "strength or solidity necessary for the purpose to which they "may be applied. These cast-iron boxes or cells may be "either left open or cased in on the inside, and may (if pre-"ferred) be filled up solid with rough stone, brick, or timber-"work, according to the nature of the building, or part of "the building for which they are employed, and in some "cases the walls or structures thus formed may be faced ex-

" ternally with masonry, brickwork, or piles, the main feature
" of the invention consisting in the introduction into such
" structures of hollow boxes or cells of cast iron bolted to-
" gether, as being stronger, more economical, and easier of
" repair than the materials hitherto used for such purposes."

[Printed, 4d. No Drawings.]

A.D. 1861, April 30.—No. 1077.

LABAT, Henri Jean Théophile.—" An improved apparatus
" for hauling ashore ships and vessels of all sizes and descrip-
" tions."

According to this invention the ship is hauled up broadside on.

On a suitable foundation, grooved slides or ways are disposed at right angles to the shore. Wood blocks, connected by brackets, cross ties, tie rods, and transoms or girders form the cradle on which the vessel is shored up in the ordinary way but in a position transverse to the ways. The hauling is effected by means of two chains, " each acting on a separate
" half of the width of the cradle." These chains, which are fixed at the sides of the cradle, pass between guides and around pulleys, returning again, and so on until they reach upper centre pulleys which are made to rotate by means of a steam engine. " Hence it results from this arrangement that each
" end of chains" " become taut right and left to an equal
" degree, the cradle will receive the same speed & tractive
" force, which will be transmitted to all points in the like
" proportion. The same effect is produced in lowering the
" cradle on the ways, the arrangement being reciprocal, as it
" is only necessary to work the gearing from the back end,
" and regulate the speed by means of a brake placed on the
" horizontal shaft to ensure great regularity in launching."

Vessels may be launched by means of this apparatus, either end or broadside on to the shore. The cradle is first placed on horizontal ways at right angles to the ways of the slip. The cradle is then withdrawn, and applied on the inclined ways to carry the vessel down the inclined slip.

[Printed, 10d. Drawings.]

A.D. 1861, May 4.—No. 1128.

SMITH, Edward Pease.—" Improvements in the construction " of radial traversing carriages."

The traversing carriages may be used to deposit their loads in arcs of circles. This invention facilitates the construction of forts, lighthouses and other erections which require their foundations to be laid under water.

A segmental or circular railway is laid down, and mounted thereon is a carriage. The platform of this traversing carriage is provided with a pair of rails to receive the trucks to which it is intended to impart a radial traverse motion. The traversing carriage is made of " wrought iron beams and plates, " after the manner of constructing compound girders;" it is set upon flanged carrying wheels which are mounted on independent radial axles. The driving power is a steam engine mounted on the carriage platform. When of equal diameter, the driving wheels are caused to revolve at different speeds. The platform of the traversing carriage is open in the middle " when it is required to discharge the contents of the railway " carriages below the circular or segmental railway, as, for " example, when it is intended to form a foundation of rubble " or rough stone below water." "To adapt this traversing " carriage to the building up of masonry," the inventor proposes " to elevate at any required height above the platform " which receives the loaded trucks a railway," upon which a travelling crab is placed. The squared stones are lifted off the trucks by means of this crab, and deposited " in their proper " position on the rubble or other foundation." When building a fort isolated from the land, the necessity for floating the blocks of stone to the place of deposit is thus avoided.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1861, June 12.—No. 1499.

WALKER, William Hammond.—" A floating hydraulic lift " stage for raising navigable vessels or other heavy bodies " above the surface of the water, and an improved method of " 'blocking' or 'shoring up.'"

This invention consists in a construction of double floating stages, " the two parts being placed parallel to and sufficiently " apart from each other to admit the vessel to be lifted to be

"floated in between them. This double floating stage is con-"nected together by transverse beams or kelson girders, which "are capable of being lowered down to admit of the vessel or "other body to float over them when they are lifted up with "the vessel to be docked resting thereon."

Each of the parts of the floating stage is constructed of a number of pontoons. The pontoons of each stage are connected together by beams or girders extending horizontally across the top of the whole set of pontoons. Hydraulic lifts are employed to raise the kelson girders and the vessel upon them; the said lifts are mounted above the openings between the pontoons, and the cross heads of their rams are connected to the kelson girders by chains or vertical rods.

The keel blocks are portable and are capable of being moved when the vessel is on them. Bilge blocks are constructed to work upon inclined planes, "to be chocked under water, and "to grip the run and bilges of the vessel before the strain "comes on, to equalise not only the weight of the vessel, but "the amount of pressure on the cross beams."

[Printed, 10*d*. Drawing.]

A.D. 1861, June 15.—No. 1534.

KENNARD, HOWARD JOHN.—"Improvements in apparatus "for excavating sand and gravel under water."

1st. The construction of an apparatus which, on being lowered down on to the bed of the river, draws sand or gravel into itself by suction; "when full of sand or gravel this "apparatus is raised out of the water and emptied at any "convenient place."

The apparatus consists of a cylindrical, water-tight, iron box, having a tube, open at both ends, fitted water-tight therein. The tube passes through the bottom of the box, upwards inside the same "to an extent which is governed by "the nature of the soil which the pump is to remove." Two or more openings in the top of the box are provided with valves opening outwards. A tube of large diameter, over a central opening, contains a weighted piston which is actuated by a rope from the surface of the water. When the piston sinks down, the water, which the rising of the piston has drawn into the apparatus together with the sand, is expelled through the

valves, and the operation is repeated. Some modifications of the above-described arrangement are described and shown.

2nd. The construction of an apparatus which, on being lowered down on to the bed of the river, disturbs the sand, so as to force it into the bag of the apparatus. The bag is formed of a large flat sheet of flexible material having a hole in the centre, around which is fixed a shallow ring of iron, whilst a deeper ring is fixed round the outside of the bag. Each ring is hung from ropes, so as to be lowered down or hauled up with facility. An agitator or disc works up and down inside the central ring; it works in a guide, and the force with which it falls drives the water and sand over the edge of the central ring into the bag.

[Printed, 10*d*. Drawing]

A.D. 1861, August 5.—No. 1944.

SEILER, Frederic.—"An improved mode of overleaping "differential levels, applicable to canals and to other pur- "poses."

This invention "consists primarily in the employment of "compressed air, gas, or other like agent, for raising and "lowering boxes or chambers containing water for receiving "boats, barges, and other vessels to different water levels, "and it is particularly applicable to canals and rivers." Two reservoirs are formed at different levels, and, in each, is placed "a double box or chamber open at bottom, and formed at top "with a case for containing sufficient water to float whatever "vessel may be required to be raised or lowered; they are "also provided with swing gates, and are in communication "with one another by means of a pipe provided with stop- "cocks. To raise a vessel from the lower to the upper level, "the chamber is caused to descend in the reservoir nearest the "low level, so that the water therein may be on a level with "it, and the vessel enters the chamber, the gates of which are "then closed; compressed air is forced into the chamber, "which rises until it reaches the intermediate water level; "the vessel is then passed to the other chamber, and the "compressed air allowed to return from the first to the "second chamber, which raises the latter and with it the "vessel to the upper level. To descend from the higher to "the lower level the reverse action takes place. [illegible] "by this means [illegible]

" one and the same time, and without any loss of water
" When once the compressed air is forced in, it may be used
" over and over again."

[Printed, 10*d*. Drawing.]

A.D. 1861, September 13.—No. 2282.

SUTTON, CHARLES.—" An improved method of and apparatus " for indicating the position of sunken ships or other vessels."

This invention "consists in applying to ships or other such " vessels a buoy or other body capable of floating, and in con- " necting the same to the vessel by a rope capable of unwind- " ing from a reel or similar apparatus, so that as the ship sinks " the said rope will be unwound, and allow the floating body " to rise." A weighted lever (or brake) is applied to the reel, " which will prevent the rope from unwinding when the sur- " face of the water is attained by the buoy."

A framework, bolted to the deck of the vessel, carries standards upon which the buoy rests. A rope is attached to the bottom of the buoy, which, after passing through a guide, is wound upon a reel mounted upon an axis which turns in the framing.

Supposing a ship or vessel provided with this apparatus should sink, the buoy will immediately begin to rise, unwinding the rope from the reel, and constantly keeping on the surface of the water; "the position of the sunken ship or vessel " will therefore be indicated, and the brake acts, as before " mentioned, to keep the buoy over the ship or vessel."

[Printed, 8*d*. Drawing.]

A.D. 1861, October 3.—No. 2467.

LAW, HENRY.—" Improvements in machinery and apparatus " for raising ships and other vessels out of the water for the " purposes of examination, cleaning, or repair, some of which " are applicable to the docking of vessels for the same pur- " poses."

1st. "The placing of the machinery for moving the cradle " upon which the ship is supported in a vessel directly at- " tached to the cradle," and arranged so as to allow "of its " travelling along the inclined slipway underneath the water, " and so imparting motion to the cradle without the inter- " *vention* of a rope or chain." A chamber filled with air,

open at the bottom (forming a species of diving bell) is "at-
" tached to the fore part of the cradle, so as to enable a person
" to examine each portion of the slipway previous to the
" cradle passing over it."

2nd. "Forming the apparatus for supporting the sides of
" the ship of hinged levers or flexible straps, or arranged as a
" network, so as to afford the vessel a more uniformly dis-
" tributed support."

3rd. So constructing the blocks for receiving the ship as to show the moment at which contact with each block takes place. The making or breaking of an electrical circuit signals the contact of each block to a person above water; or the compression of a tube containing fluid, or the motion of a bell wire may be used to signal the said contact.

4th. "So constructing the blocks or supports for receiving
" the ship that they shall retain and exhibit the form of the
" vessel, and so enable their upper surfaces to be exactly
" adjusted for the reception of the same."

[Printed, 1s. 6d. Drawings.]

A.D. 1861, November 6.—No. 2788.

RAMSELL, WILLIAM.—"Improvements in the construction
" of boats, barges, buoys, and other like structures of metal,
" and in machinery employed therein."

According to this invention, the above-mentioned structures are stamped "from one or more plates of metal by means of
" machinery, consisting of top and bottom dies or stamps and
" moulds, between which the plate of metal is pressed by steam
" or other gas, or by hydraulic pressure." The inventor employs "a cylinder containing a piston armed, by preference with
" five piston rods, each and all of which are capable of being
" connected to and disconnected from the top die or stamp,
" according to the work to be performed."

The drawings show tools or dies for stamping plates into a concave and convex form, these plates being applicable to the formation of buoys. Two buoys are also shown, which are stamped in two parts by means of dies. "When stamped the
" two corresponding parts are rivetted or otherwise secured
" together, and fitted with apparatuses commonly applied to
" buoys."

[Printed, 2s. 2d. Drawings.]

A.D. 1861, December 24.—No. 3226.

COCHRANE, John.—" Improvements in apparatus employed " in sinking cylinders and open coffers for forming foundations " under water."

When sinking cylinders, there is formed at the upper part a chamber with an opening into it from the atmosphere, as well as an opening into the cylinder below. Both these openings can be closed air-tight, and are for the passage of the workmen into and out of the cylinder. The required length of cylinder is made in suitable lengths, provided with internal flanges to fix them together. The buckets to carry up the materials as they are excavated are caused to ascend and descend in a pipe which descends from a point above the upper closed chamber down to and so as to dip into a well where the work is being carried on. The descending pipe is made in lengths corresponding with the lengths of the cylinder, and is so wide as to allow a bucket to pass up and down freely, leaving a space all round for the free passage of water. "By these means when the water is driven out of the " cylinder or coffer of other section by compressed air it will " remain in the pipe, and will stand at or about the same " level as it does outside of the cylinder or coffer. The buckets " are raised and lowered by any suitable mechanism outside " of the cylinder or coffer, consequently the only workmen " who will be working in a compressed atmosphere will be " those who are digging or removing the earth or materials " at the bottom of the coffer, and they will when they have " filled a bucket place it under the lower end of the pipe and " attach it to a chain or rope, when the full bucket will be " raised up through the water in the pipe."

[Printed, 1s. 4d. Drawings.]

1862.

A.D. 1862, January 25.—No. 199.

WRIGHT, John.—" Improvements in constructing works " below water."

This invention is applicable in the case of cylinders open at the bottom where the water is kept out by means of air under

pressure. The invention consists in employing this method of working to form continuous foundations for sea walls, in place of constructing coffer dams. The cylinders employed "may be extended at their lower ends so as to obtain a cham-"ber larger than the upper part, in order that the section of "a foundation may be of greater length than the diameter "of the upper part of the cylinder or coffer." The section of the work proceeded with inside the cylinder is made shorter than its diameter. By this means the cylinder may be lifted and moved a distance from time to time, thus constructing the work in sections with gaps between. To make the structure continuous, the cylinder is moved over the gap between two sections of the work, and the water is forced out from the said cylinder by pumping air therein. The work-men then proceed to close in the ends of the gap so as to make a coffer dam thereof, and to remove the water therefrom by pumping; the two contiguous sections can then be joined together by the workmen in the cylinder. Each gap can be proceeded with in this manner and the wall thus made continuous. "When the foundation requires to piled, "then ordinary machinery for driving piles is arranged "within the coffer or cylinder, and piles are driven thereby, "and the upper ends of the piles may be cut off. In these "cases provision will be made for introducing the piles at "the upper end of the cylinder or coffer."

[Printed, 10*d*. Drawing.]

A.D. 1862, February 7.—No. 328.

CLARK, WILLIAM.—(*A communication from Henri de Lapparent.*)—"Improvements in preserving timber, which are "particularly applicable to the timbers of ships or other "maritime structures."

The maritime structures to which these improvements are applicable, are quays, piles, piers, foundations, embankments, &c.

The wood is first deprived of its sap by endosmose, by plunging it into soft water. The wood is then dessicated, by introducing it into an hermetically closed vessel, passing a jet of steam through the wood, and then obtaining a vacuum by the combined action of cold water and of an air pump. "The

"wood is then ready to receive a current of heated air with "which a certain quantity of sulphuric acid is mixed, in order "to prevent any formation of fungi." Lastly, the wood is put together in the usual manner and its entire surface is charred by means of a special apparatus.

The drawings show a coal furnace with a blowing apparatus and with tubes connected to a gasholder from which the charring nozzle proceeds, being joined thereto by a suitable tube.

[Printed, 8d. Drawing.]

A.D. 1862, February 26.—No. 518.

DAVIES, George. — (*A communication from Pierre Lucien Fontaine.*) — (*Provisional protection only.*) — "Improvements "in emptying or draining the water from careening docks in "maritime ports."

The said emptying has hitherto been effected by means of pumps actuated by steam engines. The present invention "consists principally in the utilization of the tides for the "purpose of effecting the necessary drainage, which system "appears to result from the very nature of the operation in "tidal ports. The ordinary process is to admit the vessel "into the dock at high water, and placing it in the required "position to allow the water to ebb until it has attained its "lowest level, the dock gates are then closed and the draining "commences. It will be readily understood that a reservoir "might be made near to the dock into which the water is "admitted and retained at the high water level by the "closing of a shuttle or sluice, and when the time of drainage "arrives the water retained in the reservoir may be employed "to actuate a turbine or other hydraulic machine, which "giving motion to the pumps will effect the emptying or "draining of the dock."

During the intervals between the draining operations, the water of the reservoir may thus be utilized to actuate any kind of machinery.

[Printed, 4d. No Drawings.]

A.D. 1862, April 3.—No. 941.

NEWTON, John. — Improvements in the construction of "breakwaters, piers, and sea walls."

"This invention consists in forming suitable hollow iron "or timber casings, braced or stiffened, as may be required, "which are lowered or placed on the bottom of the sea or "beds of rivers, or in any place where such works are required. "The casings are then bolted, rivetted, or otherwise fixed "and secured together. The further ingress of water is "then prevented by means of clay and sheet lead or other "suitable substances placed round the base of the casings "when sunk. The water in the casings is then pumped or "taken out to enable workmen to perform any operation, "such as putting in concrete, clay, or any other suitable "material, thus forming a structure properly adapted for "the purposes to which these improvements are applicable."

In forming a wide pier, two sets of casings are used; "the inner sides" "of each of these casings are so formed "by being bolted together on the outer face that they can "be removed when necessary. When the two lines of piers "are carried to a sufficient distance a suitable door or web "is fixed at the end of the space between the two piers or "walls; the water is then taken out, and the inner casings "having been removed the space is filled in with concrete "or other material, and the roadway formed on the top."

[Printed, 1s. 4d. Drawings.]

A.D. 1862, April 15.—No. 1088.

PEACOCK, Richard Atkinson. — "Improvements in con-"structing and working lock gates for docks, harbours, "canals, and navigable rivers."

1st. "Constructing the framing of lock gates in layers "or thicknesses of planking." — "The frame of the gate is "formed of a number of horizontal beams each built up of "eight or other suitable number of planks of wood rough as "they come off the saw." Each plank is bedded in putty and the whole spiked together, coated with asphalte, and sloped. A similar upright connects these horizontal beams, and the whole frame is secured to heel and mitre posts, The structure is further strengthened by diagonal beams, the bottom end of one of which rests in a shoe carried by a metal pivot.

2nd. The gate is sustained without any support from the bottom by bracing up "the framing by means of horizontal "wrought-iron truss rods supported in the middle." The weight of the lock gates is supported on pivots at the top. Each pivot is carried by a strong cast-iron girder built into the upper part of the pier. The mitre post, or outer edge of the gate, is connected "with the boss which serves as one of "the pivots by two wrought iron tie-bars (more or less) "the one leading to the bottom of the mitre post and the "other to a point near the upper part of the gate."

3rd. "Forming mud recesses in the piers at the back of "the gates." The gates, on being opened, sweep the mud into these recesses, "where it may remain until carried away."

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1862, May 5.—No. 1336.

BUSHBY, ROBERT.—(*Provisional protection only.*)—"An im-"proved method of lifting or lightening ships for entering "shallow harbours, or docking and other purposes."

Tanks or buoys of sufficient buoyancy are applied on each side of the ship. A chain passes under the ship, and through a water-tight trunk in the tanks. The tanks are then immersed by admitting water into them, the slack of the chain is taken in and made fast, and the water pumped out, thus raising the vessel sufficiently to enable it to enter the shallow dock.

In another plan, the tanks may "be made small enough to "be bousted down with luff tackles."

To immerse the tanks, screw jacks, with multiplying pinion wheels, may be used.

Instead of tanks, buoys, or steam boats with watertight compartments, can be used. The engines on board the steam boats or buoys could then be used for pumping out the water from the said water-tight compartments, and thus for raising the vessel to which the steam boats are attached.

"There are two other powers that might be applied for "immersing the buoys or steamers without admitting the "water, namely, the hydraulic power, or powerful screws, the "screw to be worked on the principle of a capstan."

[Printed, 4*d*. No Drawings.]

A.D. 1862, May 15.—No. 1472.

WRIGHT, JAMES.—(*A communication from Messrs. Couvreux and Combe.*)—"Improvements in machinery for digging, ex-"cavating, and removing earth, gravel, and such like sub-"stances."

This apparatus may either be worked by steam or air. The motive power engine is on a framing mounted on wheels. Spur wheel gear communicates motion from the engine to the "square frame," over which the chain of buckets passes. Each bucket "is preceeded by a coulter or knife for penetrat-"ing and loosening the earth or soil. The endless chain "carrying these buckets is kept at the required tension by "a pole which can be raised or lowered by means of cords "and pullies on the frame of the machine. On the axle of "the first mentioned toothed wheel is an endless band passing "round and kept tight by a tension pole or rod similar to the "one before-named, this pole may be of any length and can "be raised or lowered as wished. The action is as follows:— "motion being given to the toothed wheel carrying the square "on which is the endless chain of buckets, these are lowered "to the required depth and sink by their own weight into the "ground, these buckets are open on the side next the chain, "and when in action are kept close against it, but when they "come over the pulley they turn over by their own weight "and discharge their contents on the endless table before "mentioned which removes it into a truck. This machine "can be moved in any direction on rails, and when placed on "a boat it serves as a dredging machine with the advantage "of raising the mud without disturbing the bottom."

[Printed, 10*d*. Drawing.]

A.D. 1862, May 21.—No. 1535.

GILES, ALFRED.—"Improvements in constructing floating "breakwaters."

"For these purposes a series of buoys are used, which are "connected together by metal chains in such manner that the "area over which a breakwater extends is divided horizontally "into numerous sections, by preference of a lozenge shape, "there being a buoy at each angle of a section, and in some "cases the chain which connects two buoys is further sup-"ported by an intermediate buoy. From the chains which

"connect the several buoys, and divide the whole area into "sections, there are suspended fringes or network of chains, "in order to break the waves by causing the same to pass "through the meshes or openings of the suspended fringes or "network. The outermost and innermost rows of buoys are "secured in their places by anchors. By these means the "area occupied by a breakwater is divided horizontally by "network composed of chains, the angles of which network "are supported by buoys, and from this horizontal network "other network or fringes are suspended vertically."

[Printed, 8*d*. Drawing.]

A.D. 1862, May 26.—No. 1567.

DE BERGUE, CHARLES.—(*Provisional protection only.*)—"Improvements in iron framing applicable to supporting cover- "ings or surfaces intended to resist blows or pressure."

The framework which is the subject of this invention "is "applicable to the construction of dock gates, the bottoms of "floating docks, the cradlings for foundations or piers of "bridges, the flooring of warehouses, and other coverings "or surfaces intended to resist weight or pressure."

The said framework is constructed "of two series of ribs or "beams, one series of them shaped and applied to give the "desired sections or form in one direction, and others shaped "and applied crossways to the first series to give the desired "sections or form in a cross direction, and the two series being "rivetted or connected together, and further strengthened by "struts, or ties, or bars applied in a direction at right angles "or nearly so to both sides of beams, and rivetted or connected "to both, and fitted, where necessary, with filling up or "bedding pieces for affording additional support to the "intended coverings or surfaces."

The beams are constructed with flanges, thus affording (where the beams cross) convenient surfaces for rivetting the two series of beams together. Also this method affords convenient surfaces for connecting the struts to the beams. "These beams may consist of channel or gutter-shaped iron, "being either so rolled or bent to present a flat surface and "two returns at right angles." According to modifications of this invention, the beams may be otherwise shaped to present the desired flanges for connection.

[Printed, 4*d*. No Drawings.]

A.D. 1862, May 28.—No. 1599.

ROGERSON, John.—(*Provisional protection only.*)—"An iron "floating dock to be used for the purpose of building and "repairing ships, steamers, barges, and floating vessels of all "descriptions."

The bottom of the dock or lifting platform is divided into water-tight compartments, each having a sluice and pumps which are worked by a steam engine. The sides, end, and gates of the dock are box-shaped; they have sufficient floating power to carry the weight of the columns, machinery, upper platform, and lifting platform when sunk. The lifting platform is connected with the sides by guide rods which work inside of columns placed at suitable distances along the sides of the dock. A chain, working over a sheave, is attached to each guide rod; it regulates the depth to which the lifting platform is sunk. After a vessel is floated into the dock, as the platform rises, the guide rods guide the vessel into its position, and as soon as the keel blocks take the vessel's keel, the bilge blocks are hauled in to keep the vessel upright as it is lifted out of the water. Each dock gate has a powerful winch to open and shut it. "The engine for working the pumps is "placed at the end of the dock, and the shafting is brought "along each side of the dock, working in carriages underneath the upper platform and immediately above the column "heads. On the shaft, in way of the pumps, are excentric "sheaves for pumping."

[Printed, 4*d*. No Drawings.]

A.D. 1862, May 31.—No. 1650.

CHAUBART, Léopold.—"An improved mode of and apparatus for raising the level of water in rivers, canals, and "other watercourses."

The self-acting and regulating bar or sluice which is the subject of this invention is constructed in three different parts.

The first part serves to take the water from the bed of a river and to furnish it to a branch canal in a constant volume, whatever the variations may be in the level of the water in the river. A self-regulating sluice gate is placed in a part of the passage of the river between vertical sides. This water gate is

movable, and, by means of its curved shape, causes the above effect during the balance movement of the gate produced by the variation in the level of the water in the river.

The second part keeps the water up river at a constant height, if the flow of the river does not exceed a certain quantity. This regulating overfall sluice is formed with masonry work built horizontally across the bed of the river at the side of the above-described sluice gate. The sluice is on the top of the masonry work, resting upon cams which gradually incline as the flow increases. When the water has attained a fixed height, the sluice sinks and allows a free passage to the water until certain counterweights act.

The third part raises the water for navigable purposes, and is in a line with the overfall sluice and separated from it by a pier. Two feet from the bottom of the river, on masonry, is placed a movable wrought-iron sluice, the top of which is four inches above that of the overfall sluice. "When the top is "covered by a certain quantity of water, the bar or sluice "performs a balance movement, and extends itself horizon-"tally on the top of the top of the masonry bottom. As soon "as the decreasing water has reached a depth fixed before-"hand, the bar or sluice rises, and takes its first position by "means of counterweights."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1862, June 2.—No. 1659.

ROECKNER, CARL HEINRICH.—(*Provisional protection only.*)— "An improved method of constructing cofferdams and other "similar structures for excluding or keeping back the flow of "water and preventing inundations."

This invention consists in driving piles across the bed of a watercourse, at a few feet apart, instead of driving the said piles close together in two or more rows, and ramming clay between as heretofore practised. To obviate the use of clay, waterproof sail cloth is stretched across the entire line of piles, and the top edge thereof fixed to the top of the piles. The depth of the said fabric is greater than the depth of the water course from the top of the piles, so that a part of the fabric lies on the bed of the watercourse.

"The effect of the above arrangement is as follows:—Take, "for example, a tidal river, and suppose the fabic before men-

" tioned to be placed on that side of the row of piles aforesaid " against which the water would flow and press as the tide " rises, the pressure of the water will force the aforesaid fabric " against the piles, and the pressure of the superincumbent " body of water will also press said fabric upon the bed of the " river or other watercourse, and thus prevent the passage " of water past said piles as the tide ebbs; the pressure being " removed the water at the other side of said fabric will " be free to pass out should the level thereof be higher than " that of the tide, and by these means large tracts of land " may be drained in a speedy, simple, and efficient manner, " and at a comparatively small cost, and in like manner " cofferdams and other like structures may be formed and " rendered watertight."

[Printed, 4*d*. No Drawings.]

A.D. 1862, June 27.—No. 1892.

BANKS, DANIEL LANCASTER.—(*Provisional protection only.*)—" A new method of constructing a portable covered coffer-dam, " or apparatus for facilitating operations under the water, in " the water, or out of the water, and apparatus connected " therewith."

The object of this invention is to facilitate the examination of (and repairing) the bottoms of ships, or to examine the bottoms of rivers.

An oblong box of iron is open at one end and is divided vertically across its length into two compartments; thus one of the compartments is closed, the other is open. By means of a flange, vulcanised sheet india-rubber is attached round the edge of the open compartment, so as form a continuation thereof. This india-rubber continuation is, by means of set bolts and pressure plates, applied against that portion of the structure upon which it is desired to operate, and the water is pumped out from the compartment thus formed. To enable men to enter the closed compartment, a main pipe is connected to pipes of suitable bore with elbows and stuffing boxes, that enter at the two sides thereof; "also the partition which divides " the box is constructed with a manhole and lid, provided " with means for keeping it water-tight." In some cases the main pipe is dispensed with. "The dam may be hung in the " same manner as a compass, with a tubular communication

"through its hangings from the main to the compartment; "also the whole or any part of the dam may be galvanised "as required, and also the dam may be used as required."

[Printed, 4d. No Drawings.]

A.D. 1862, June 27.—No. 1893.

BANKS, DANIEL LANCASTER.—(*Provisional protection only.*)— "A method of constructing a portable sectional dry dock and "apparatus connected therewith."

An iron caisson is, in plan, of the shape of a right-angled triangle, this figure being the base of a prison. The hypothenuse of the right-angled triangle curves inwardly towards the right angle. The caisson is floated upon one of its flat sides. Two ribs are attached upon the curved side of the caisson, "leaving a margin between the outer sides of the "plates and the outer edge of the side of the caisson." The two ends of the plates at the base end of the caisson are connected "by a cross plate, leaving a similar margin outside of "it; thus the plates are continued round the three sides of "the caisson's curved side, leaving a margin." Vulcanised sheet india-rubber is attached to the said plates, so that an enclosed space may be obtained between "the curved side of "the caisson and the plates on edge and cross plate" with the india-rubber edging; this space, when dry, is called the inventor's "portable sectional dry dock." The dock with the india-rubber edging is applied against that part of the structure upon which it is desired to operate, and the water is pumped out of the dock.

In constructing sectional docks according to this invention, "one or more caissons may be used, and the sectional dry "dock may be any fractional part of a dock. Also the whole "or any part of the ironwork of the dock may be galvanised "as required; and also the dock may be used as required."

[Printed, 4d. No Drawings.]

A.D. 1862, July 1.—No. 1918.

LUNGLEY, CHARLES. — "Improvements in constructing, "building, and working floating docks and other floating "bodies, and in pumping apparatus to be employed therein."

The portion of this invention which relates to the construction of floating docks, &c. is as follows:—

The said docks, &c. are built in distinct sections which may be connected afloat. "Each part or section of the dock is "composed of three parts in the shape of parallelopipedons "or in other convenient shapes, so as to form when combined "a pontoon with side piers. Such pontoon or hollow dock "bottom can be built and launched or floated before the "hollow side piers are built, and such piers can then be built "on the pontoon or hollow dock bottom without incon-"venience, where required, even in a foreign country or "distant place, as the pontoon can be made sea-worthy, and "may be propelled by steam or sails to any place required "carrying the material or piers for building the side piers "and other dock sections. When one or more such pontoons "with side piers are completed, they will form an efficient "dock for building other sections upon without any other "accommodation, such sections being undocked and placed "on end of those on which they were built, until enough "parts are together, to form the dock of the dimensions "required."

[Printed, 10*d*. Drawing.]

A.D. 1862, July 15.—No. 2031.

COUVREUX, Alphonse.—"An improved centrifugal appa-"ratus for casting stones and other materials, and in forming "embankments and other structures."

This invention "relates to an apparatus for throwing stones "or any other earthy matter required for the formation of "embankments, dykes, and breakwaters, &c." The inventor makes use of "a large wheel which revolves at a very high "speed on which are placed a series of paddles or buckets, "the stones are conveyed into the inside of the frame by "means of a shoot, and are taken up by these paddles or "buckets and thrown off at a tangent through another shoot "which can be elevated or lowered according to the distance "they are required to be thrown, the whole is mounted on a "wooden frame, the wheel is driven by means of a pulley "and strap from an engine, or any other convenient motive "power."

By the use of this invention, "embankments for railways, "for docks, or such like works can be constructed very "speedily, and at a less cost than at present."

[Printed, 8*d*. Drawing.]

" encloses nearly one half of the diameter of the screw." The casing is open at the upper part to afford an escape for the sand raised by the screw, whence it is carried by the current through the plates of the driving wheel and so uniformly distributed.

[Printed, 8*d*. Drawing.]

A.D. 1862, October 21.—No. 2839.

TOLHAUSEN, Frederick. — (*A communication from Jean Jerome Rancurel.*) — (*Provisional protection only.*)—" An im-" proved machine for raising, lowering, removing, and carry-" ing buildings, monuments, and ships or vessels."

" This machine consists of a skeleton frame or scaffolding " built all round and underneath the building, ship, or other " heavy body to be moved. The part of said frame that is " underneath is made moveable and the other part is sta-" tionary. The moveable part is fitted with a number of nuts, " into which work screws that are drived by double or treble " worm and wheel gear so as to produce the power required " for lifting the heavy body by means of the screws aforesaid; " said heavy body is then placed on rollers or casters to be " removed to its final place of destination."

[Printed, 4*d*. No Drawings.]

A.D. 1862, December 9.—No. 3295.

WINGATE, Thomas, junior.—" Improvements in dredging " machinery."

This invention relates to " the working of the endless chain " of buckets " in a dredging machine.

By the present invention " the buckets are, according to " one modification, connected directly to each other, so as to " apply themselves to every side of the tumbler. The " number of buckets for a given length of chain may be " varied, but if the number of buckets is about the same as " usual there will necessarily be greater spaces between the " joints of the endless chain, and the tumblers or pulleys will " require to be made larger. In this case the back of each " bucket, or the links to which each bucket is attached, will " be larger, and the proportions of the parts will permit of a " much better action of the bucket in passing round the lower

"tumbler or pulley, at which part it has to cut through and "fill itself with the materials being dredged.

"According to another modification a very short link is "introduced between each bucket to facilitate the repairing "of the joints, but every side of the tumbler still receives and "cants a bucket. The tumblers or pulleys may be made "with any convenient number of sides. One advantage "resulting from the improved arrangements is that with the "same number of buckets the upper tumbler may be driven "at one half the speed necessary with the old arrange-"ments."

[Printed, 10*d*. Drawings.]

1863.

A.D. 1863, January 22.—No. 204.

LUNGLEY, Charles. — (*Provisional protection only.*)—"Im-"provements in means for facilitating the repairs of ships "and other structures."

"My invention consists in digging or forming pits in the "ground and placing therein caissons with trunks for access "and for air; or I make the pits watertight with cement or "other materials suitable for the purpose. I fit campshead "of wood or other material to receive the fittings for making "the parts watertight round the ships or other structures "when they are brought over the pits."

[Printed, 4*d*. No Drawings.]

A.D. 1863, March 3.—No. 590.

LYSTER, George Fosbery.—"Improvements in mooring "buoys."

This invention "consists in constructing mooring buoys in "such a manner that, instead of being attached to the moor-"ing chain, and serving as the point of attachment for the "vessels, the buoy acts simply as a float or carrier for keeping "the end of the mooring chain above water, the latter being in "no way attached to the buoy beyond passing through an "aperture formed in the same, and when not attached to the

" ship's cable, being prevented from falling through the aper-
" ture by the larger dimensions of the mooring ring."

In most cases several mooring chains, or several lengths of chain attached to one main mooring chain, are passed through the aperture of the buoy, each chain being provided with a ring.

The buoy is constructed of a hollow metal vessel of an annular form, the central aperture being somewhat smaller than the rings of the mooring chains. The bottom surface of the buoy, or both the top and bottom surfaces thereof, are " concave or recessed, more or less."

If the upper surface of the buoy be recessed to a greater depth than its water line, suitable hooks are fixed to the buoy above the water line. Upon these hooks the rings of the mooring chains are hung when not in use.

[Printed, 10*d*. Drawing.]

A.D. 1863, April 11.—No. 921.

BALY, PRICE PRICHARD.—" Improvements in constructing " breakwaters, piers, sea walls, and other similar struc- " tures."

In constructing the said works the inventor employs at intervals transverse iron frames, triangular in form, and, if necessary, strengthened interiorly by other bars, rods, or plates which divide the frame into a number of small triangles. The base of each frame is suitably secured to the bottom. To the sides of the frames corrugated iron plates are fixed to form two faces of the structure that are inclined to one another. Further stiffness is given the structure by cross bars placed on the exterior of the plating. " The side of the transverse frame " acting with the corrugated or ridged plating attached to it " and with the exterior bar parallel thereto, form together a " framed girder of great strength."

" Where an extensive surface is required at the top rect- " angular frames may be employed."

In some cases the opposite sides of each frame may simply be connected by a bar or chain at or near the base. The corrugations may be arranged to run vertically, or in an inclined direction. The interior of the structure may be filled with masonry or other like materials. The upper parts of the works may have platforms, or stagings, or ways.

"In constructing sea walls and similar structures having " only one face," the inventor employs " corrugated or ridge " and furrow plating supported on frames securely fixed to " the land, and strengthened by bars running across the " ridges and furrows, as already explained."

[Printed, 3s. 2d. Drawings.]

A.D. 1863, April 20.—No. 984.

HUGHES, Ebenezer William. — "Improvements in turn- " tables, turnbridges, and slips."

A system of spheres and wheels is applied to the above-named purposes, in conjunction with a fixed track. The said track is formed with a hollow groove of an elliptical cross section; this groove is placed between two rails suitable for the support of the above-mentioned wheels. The under surface of the turntable, turnbridge, or slip is also made with a groove.

In applying the system which forms the present invention to a slip "in place of the ordinary arrangements for sup- " porting the carriage of a slip," a rail with a concave surface for the reception of the spheres is laid down the whole length of the slip. The spheres are received by the grooved surfaces of blocks fixed under the carriage. "The spheres " are kept apart by means of wheels on parallel axles, which " are retained at equal distances apart by means of endless " chains," "The set of spheres which work with each block " act with their endless chain of wheels as if the whole formed " one endless chain, some of the spheres and wheels being at " all times under the block, whilst others are within the " hollow passage through the block."

[Printed, 10d. Drawing.]

A.D. 1863, May 15.—No. 1225.

MALLET, Robert Trefusis.—"Improvements in the con- " struction of piers, walls, and other similar structures, and " of landing stages, and in the connections therewith or " attachments thereto."

By means of long wrought-iron caissons sunk with their ends as close together as possible, and a coffer-dam constructed

from their top edges, together with guide piles and iron plates, "a continuous double line of water-tight wall is formed, open "at both ends, of indefinite length, and capable of being "taken from at one end and added to at the other." In commencing operations, a closed rectangular coffer, formed as above, is emptied of its water and the wall built up. To continue the wall into the next section without breach of continuity, a diaphragm from the face of the wall to the nearest pile is from time to time built up, as each section is finished; when the next section of the continuous dam is completed and emptied of water, the cross compound plate separating it from the previous section can be removed, and so on.

Landing stages are moored to the shore by a system of diagonal bracings, which also forms the support for the approaches. A series of steps are formed by means of an arrangement of planks, rods, and links; "by this means a "parallel motion in the several planks is obtained, so that "they will form a level gangway when the 'dummy' is even "with the quay or wall, and a series of steps in any other "position."

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1863, May 27.—No. 1332.

KENNARD, Howard John.—"Improvements in the construction of wrought-iron cylinders for piers or piles to "bridges, viaducts, or for other foundations or structures "where the sinking of cylinders is required."

The said cylinders are constructed "of segments having "internal flanges fixed or formed upon them for bolting them "together, the meeting edges of such segments being planed "or turned so as to form more or less perfectly air and water "tight joints."

The following is the manner preferred to form the flanged segments:—Angle iron is made "of such a form that upon "one external face of the same there is a raised surface or "fillet running along at or near the apex of the angle iron." This angle iron is rivetted "in an air or water tight manner "upon the inner surface of the plates forming the segments "round the edges of the same, in such a manner that the side "of the angle iron having the raised surface or fillet forms

" the flanges to the segments, it being for this purpose pro-
" vided with the requisite bolt holes." The said raised surface or fillet is then planed or turned, and also the edges of the plate are planed or turned, "so that the fillet and the " edge of the plate together form a perfect plane meeting " surface, thereby insuring a water or air-tight joint between " the segments when bolted together to form the cylinder."

In a modification of the invention T-iron may be employed instead of angle iron.

[Printed, 10*d*. Drawing.]

A.D. 1863, June 24.—No. 1591.

HODGE, PAUL RAPSEY. — "Improved fleeting hydrostatic " machinery adapted to presses, dry docks, slips, or the " moving or lifting of heavy masses, parts of which are appli- " cable to the expressing of oil or other fluids."

A portion of the said machinery "is applicable to the raising " or lowering of heavy weights by this fleeting combination, " such as the lifting of ships either by vertical or horizontal " cylinders, rams, and spuds, with their arrangement of racks " and catches for holding on of the previous stroke."

The said portion consists in arrangements "to accomplish a " long range of traverse with a short cylinder and ram in con- " nection with a 'follower' and 'spuds,' and also in connec- " tion with either racks or screws to accomplish any portion " of a stroke of the follower, and the final to be completed by " hydrostatic pressure." A fleeting piston is attached to the ram, and the water acts on both sides of the said piston. The spuds and follower are held at the terminal point of each stroke, when the water is reversed to the under side of the piston; this sends it (the piston) up with the cross head to its original position ready again for another downward stroke. " The spuds are then attached to the cross head by means of " catches and racks or cotters, and cotter holes in the spuds, " and is there held. The water is again reversed to the top " side of the piston, when another two feet stroke is accom- " plished downwards, and so on to any number of strokes " until the distance to be traversed is effected."

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1863, July 9.—No. 1710.

WESTMACOTT, Percy Graham Buchanan.—" Improvements " in cranes and dock-gate and other crabs."

" For these purposes a rotating hydraulic engine is combined " with the barrel of a crane and with the barrel of a dock-gate " or other crab in addition to the ordinary hand gearing used " for giving motion to such barrels, by which the barrel of a " crane or the barrel of a crab may be caused to rotate, either " by manual power through the ordinary hand gearing, or by " the working of the hydraulic engine, arranged to work in " combination with the same barrel."

The hydraulic engine may consist of two or more oscillating cylinders, the driving wheel on the engine shaft acting directly upon the first motion of the crab. Provision should be made for connecting and disconnecting the engine when the hand gearing is to be used.

The drawings show the crank shaft which receives motion from the hydraulic engine, the first motion spindle for hand gearing, the drum or barrel for winding on the dock-gate chain, and the clutch for connecting the hydraulic engine, in order to work the crab thereby.

A suitable arrangement of valves and other apparatus are shown to enable this invention to be be applied to raising and lowering weights as well as to working dock gates.

[Printed, 1*s.* 8*d.* Drawings.]

A.D. 1863, July 10.—No. 1723.

DE BERGUE, Charles.—" Improvements in piles for founda- " tions, and in piers for bridges and other buildings or struc- " tures."

This invention consists in constructing cast iron cylindrical or other shaped piles of a series of lengths capable of being united to form a long continuous pile. The ends may be squared and screwed into a socket to form the requisite joint; or they may be connected by simply screwing them together; or an external screwed joint piece may be used.

These piles may be combined in series into a foundation, or pier, or substructure. If continued into a superstructure, capping, bracing ties, or other means of union are employed.

" The intention is, that the bottom length is to be pointed, " and that the pile, either in two or more lengths, is to be

"driven by means of a heavy ram with a small lift, so as to "produce an effect assimilating to pressure rather than a "sharp blow, and using a temporary capping of metal or "wood or other materials, either separately or in combination, "the capping being removed and transferred to the top of "each length as it is successively added. If any inequality "of level of top surface of a series of such piles should occur "from difficulty of driving to an uniform level, then special "top lengths may be employed."

[Printed, 1s. 4d. Drawings.]

A.D. 1863, July 15.—No. 1777.

TAMET, DOMINIQUE.—"Improvements in breakwaters, and in "the construction of rail and other ways thereon."

Amongst other uses for which this invention is intended, the formation of a railway crossing the British Channel is one.

To construct a breakwater according to this system a timber raft or box of sheet iron is sunk in the sea below the point where the undulations of the waves affect the water, and where "the sea is quite calm." Upon this raft is placed rows of beams forming a diagonal framework; the lozenges of the first row are opposite to the cross bars of the second, and so on. The raft is provided with chains and cables, and is therewith anchored to the bottom of the sea; the top of the framework is considerably above the surface level.

In crossing the British Channel two of these breakwaters are formed, say, from Dover to Calais, parallel to one another, and about 150 feet apart. The railway is placed midway between the breakwaters; it is upon the same plan, but the timbers which surmount the raft are placed vertically and horizontally, so as to expose as little surface as possible to the waves. The rails are fixed upon a floor at the upper part of the framework, at the bottom of a deep groove, to prevent the carriages from running off the line. There are at various distances openings for the passage of vessels, sheltered by breakwaters; and a movable bridge for this purpose carries the railway at each opening.

[Printed, 8d. Drawing.]

A.D. 1863, August 6.—No. 1937.

DOWSON, Joseph Emerson.—"A new application of rolled
" metal plates to the formation of roadways, bridges, tram-
" ways, and other structures."

"This invention relates to the manufacture and use of
" rolled metal plates of a trough-like section, having flat,
" concave, convex, or otherwise formed soles or webs, with
" angular edge plates or flanges along each side." These flanged plates are bolted together, either flange to flange, or with abutment pieces between the flanges. By these plates are formed "breakwaters, harbours, jetties, piers, dams, or
" weirs, or other sea or river structures."

This invention also relates to the application of the said plates to the formation of piles and the like, by joining the plates with single or double-headed T iron. The flanges may project internally or externally or both internally and externally as the case may require.

To increase the strength of piles, for instance, a "flitch
" plate" may be introduced, "running through their axes
" longitudinally."

This invention also relates to the formation of grooves or channels in combination with piles, or the like, formed of the said metal plates, by attaching such grooves or channels to the said piles, through the flanges thereof. The grooves
" serve to hold in place slabs of stone, plates of metal,
" timber, framed or otherwise, or any other suitable material
" for forming retaining, sea, and other walls, or for holding
" in place the aforesaid rolled metal plates."

[Printed, 10*d*. Drawings.]

A.D. 1863, August 19.—No. 2060.

SCOTT, Thomas. — (*Provisional protection only.*)—"Improve-
" ments in the construction of floating docks or apparatus for
" lifting ships and other bodies."

Two vessels form the sides of the dock and support the steam and hydraulic machinery; they are covered with a deck. "Between and entering to a certain extent through the
" inner sides and into the interior of these supporting vessels
" there are beams or girders connected by chains to hydraulic
" rams, carried on and under deck on each of the supporting

"vessels." Compartments in the vessels receive the ends of the girders, "and every alternate compartment extends further "inwards than the others, to allow of the rams being arranged "in two lines." A deck rests upon the sides of the compartments, and forms a cover for the same. Longitudinal girders extend along this deck, and between them there are "two "rows of horizontal hydraulic rams, worked by a steam engine "supported upon this or upon the upper deck;" chains are carried through holes in the under deck, and they are connected at one end to the transverse beams and passing over a pulley are attached at the other end to the hydraulic rams. Vertical guide bars, connected to the transverse beams, have friction rollers and move up and down through the top of the compartments and through the upper deck, "which is sup-"ported by the longitudinal girders between which the rams "are placed on the under deck, and by the sides and ends of "the vessel."

A ship being "upon the transverse beams and between the "two supporting vessels, the whole of the rams are set to "work simultaneously, and raise the beams as well as the "ship upon them." The water supply to both sides of the dock is connected by means of telescopic tubes.

[Printed, 4*d*. No Drawings.]

A.D. 1863, August 24.—No. 2096.

STACK, FREDERICK RICE.—"Improvements in the construction "of military bridges, piers, landing stages, and escalading "apparatus."

Each structure is made longitudinally of two or more trussed beams combined together transversely; the upper or lower parts of the combined beam have a floor produced thereon by fixing thereto parallel fillets of wood or other adaptable materials. "The combined or framed beam is mounted near one "of its ends on an axle, with or without springs, having two "or more wheels, which may be readily removed from and "readily applied to the axle as occasion may require. At "that end of the beam which is mounted on the axle there "may be for some purposes applied a system of cross bars, by "which a number of men may be employed in moving the "beam in the required direction."

To protect the men from the fire of the enemy, a bullet-proof shield is fixed at one part of the apparatus.

The said structure is formed "in such short lengths that it "may be taken to pieces for convenience of transport in ships, "or for transport on land, or that it can be folded up, slid, "or placed together in a cart or wagon."

[Printed, 1s. 8d. Drawings.]

A.D. 1863, September 5.—No. 2196.

RENNIE, GEORGE BANKS.—"Improvements in the construction "of floating docks and pontoons, and the means of cleaning, "painting, or repairing them."

The base or pontoon of a floating dock is constructed with each end taper or pointed, or made bow-like on the plan.

The base portion of a floating dock, such as that described in No. 746 (A.D. 1860), is constructed "in separate pontoons "having a central air chamber, each side wall being a con-"tinuous structure, the base of the dock only being made up "of separate pieces or sections."

The mode employed to unite the separate chambers forming the base of the dock as well as the longitudinal side walls placed on top thereof, is as follows:—The pontoons are united longitudinally by angle and plate iron, together with wood distance and packing pieces, which serve also as fenders. The side wall is attached to the several pontoons by vertical plates united by an angle or T-irons "in such a manner as to leave "a distance sufficient to enable a workman to have access to "the stuffing box of the suction and other pipes and connec-"tions with the machinery between the side walls and the "base of the structure."

The apparatus for connecting together, disconnecting, cleaning, painting, or repairing the said pontoons consists of a rectangular box which is sunk under the portion of the pontoon to be operated upon and fitted thereto, its shape being suited to the contour of the pontoon. The pressure of water causes certain elastic cushions to effect a water-tight joint between the pontoon and the said apparatus.

[Printed, 1s. Drawings.]

A.D. 1863, October 13.—No. 2512.

SCOTT, THOMAS.—" Improvements in floating docks."

This invention consists in forming a chamber between the side walls or girders and the lower parts of the structure, of sufficient width and depth to admit of withdrawing or inserting fastenings (bolts and nuts, for instance), which connect the side walls with the lower parts of the structure. This space also allows of access to the pump connections, between the side walls and the base portions of the dock, to detach or re-attach the said connections. Thus the lower parts of the dock being constructed in sections, one or more of such sections may be removed, or replaced without interfering with the efficiency of the dock.

The side walls are separate from the base portions, and are rigid and self-sustaining; they are capable of being floated, towed, and manœuvred independently.

"The engines, pumps, and working apparatus generally are " contained within the side walls, and placed by preference in " a separate compartment situate in the centre of the length " of each thereof. Each of the pump connections of the " several sections of the base of the dock is separately con- " nected to the corresponding pump connections of each of the " side walls of the structure."

Reference is made to No. 1918 (A.D. 1862).

[Printed, 1s. 4d. Drawings.]

A.D. 1863, October 22.—No. 2593.

BAILLIE, ROBERT.—" Improvements in the construction of " floating docks."

These floating docks have "pontoons for the sides, com- " bined with transverse and longitudinal girders forming the " bottom of the structure, such sides and bottom being " respectively independent of each other, except as they are " connected by a number of hydraulic cylinders and rams, or " other mechanism, for raising and lowering the bottom of " the dock as required."

The sides of the dock are composed of a series of pontoons braced together. The space between each pontoon is wide enough to admit of the tranverse girders of the bottom passing up between the pontoons when the bottom is raised.

When the sides of the dock are composed of oblong pontoons extending the whole length thereof, the main girders rest against the under side of the dock when in their highest position.

Vertical racks and palls, or friction cams and plain vertical rods, retain the bottom of the dock in the required position.

Vertical lattice guides, fixed to the main girders, "strengthen "the bottom of the dock against a tendency to lateral "straining."

[Printed, 10*d*. Drawing.]

A.D. 1863, November 18.—No. 2889.

ELDER, JOHN.—"Improvements relating to floating and other "docks."

These docks are so formed as to be capable of being navigated by wind or steam power. The ends "are shaped with "projecting centres gradually rounded into the sides, and "more particularly into the bottom, so that the entire bottom "becomes like that of a long, flat, parallel-sided boat." The dock may be furnished with a keel and with a rudder. In order to ensure steadiness in an exposed situation, it may be immersed to an extra depth by retaining or putting sufficient water in the compartments; otherwise it is preferred that the dock should have a light draught, so as to require but little propelling power.

To propel the dock, it may be fitted with masts, spars, and canvas, or the pumping machinery may be arranged to drive screws or other propellers.

The inner shell of the dock consists of a flat floor, with the lower portions of the sides inclined and the upper portions vertical. "The space between the shells is divided by longi-"tudinal and transverse water-tight bulkheads, whilst the "whole is strengthened by diagonal bracing, and the bottom "by transverse angle iron."

This invention further comprises an improved keel block applicable to floating and other docks. The block rests upon powerful springs protected by a casing from the action of the water, and the rise of the block is limited by a bolt. By these blocks the bearing of the ship is equalized.

[Printed, 1*s*. 4*d*. Drawings.]

1864.

A.D. 1864, January 7.—No. 47.

APPLEBY, CHARLES JAMES, and VAVASSEUR, JOSIAH.—(*Provisional protection only.*)—"Improvements in coffer dams "and quay walls."

Square timbers are driven at certain distances apart with their corners pointing to the face of the coffer-dam. "The "space between the piles is filled in in front with pieces of "curved iron or other suitable material, which abut on the "angular outer sides of the said piles"; to further prevent the penetration of water into the interior of the dam, a thin strip of iron, or other metal, or india-rubber, is rivetted to the edges of the plates. The curved plates may be kept tight against the face of the piles by means of tie rods, "or of "screwed back ties to cross walings at the back of the upright "piles. These back ties are attached to the curved plates by "means of a T-iron rivetted on the inside along the crown of "the arch, or in any other suitable manner, thereby giving "additional stiffness to these plates. Altho' in the above "description the filling in of the panels has been said to be "effected by means of curved plates abutting against square "piles, it will be understood that the arrangement of the "vertical piles, which piles may be of any suitable transverse "section or material, and any convenient distance apart, is "open to various modifications, so as to admit of a filling in "by panel plates of a different configuration in accordance "with such arrangement."

[Printed, 4*d*. No Drawings.]

A.D. 1864, January 16.—No. 126.

WOOD, WILLIAM.—(*Provisional protection only.*)—"Improve-"ments in means and machinery for 'warping' or covering "land, bog, or peat with earth or soil, parts of which are "applicable in raising and conveying soil or earthy matters in "the formation and cleansing of canals, watercourses, or ways, "reservoirs, harbours, and docks."

These improvements consist "in means and machinery for "gathering, lifting, and mixing the earthy matters added to "tidal or other waters."

For gathering and lifting, the inventor employs a dredging apparatus, or a scoop wheel, or revolving screw. Whenever the earthy matter to be used is covered with or bordered by sufficient water to float a vessel, the apparatus is placed therein and the vessel is moved "from place to place as the earth is "removed from the bottom or sides of the body of water."

Artificial bodies of water may be formed over the land to be warped "by making an embankment round it, and admitting "the tidal water where the land is low enough," and in other cases streams may be directed, or sufficient water raised thereon, "so that a flat-bottomed or other suitable vessel can be floated "and moved over the soil from place to place, in which the "motive power and the other apparatus is fixed and used to "lift or gather the earth and water into the mixing and raising apparatus."

[Printed, 4*d*. No Drawings.]

A.D. 1864, January 23.—No. 182.

CLARKSON, THOMAS CHARLES.—"Improvements in ordnance "and in applying certain cylinders and tubes for forming "projectiles and recoil springs, which improvements are "applicable for forming vessels for war and pillars in deep "water."

In constructing pillars or towers in deep water, the inventor builds and alternately places cylinders the length and diameter required, leaving a space between each cylinder, and securing them by vertical and horizontal sections at the base of the pillar. It is formed on a bevil to admit its entrance into the ground. Openings secured by screw bolts, permit a space to be opened if a tunnel is required under the sea. Steam pumps and excavating machinery are fixed in one of the compartments, and thus the pillar can attain its proper depth. The earth may be tipped overboard so as to fall at the base of the pillar. The pillars are floated and towed to their destination. Water can be let in or out of the pillar, by means of valves, so as to get it into a vertical position. Pillars or towers may be formed in deep water, dispensing with pile driving machines or with coffer dams. By this invention, tunnels may be formed in deep water or under the sea by excavating internally from each pillar.

The said cylinders are of iron, and are solid or coiled. The space between the coils may be filled with a cement.

[Printed, 2*s*. 4*d*. Drawings.]

A.D. 1864, January 30.—No. 258.

PHILLIPS, JOSEPH.—"Improvements in piles or cylinders " for piers, embankments, coffer dams, and other structures " that are wholly or partially under water."

The object of this invention is to render more or less perfectly water-tight, the vertical joints, interstices, or spaces existing between metal piles or cylinders employed for the said structures.

The invention consists in forming grooves, or shoulders upon the contiguous sides of such piles, and then inserting into the grooves, or placing against the shoulders, pieces of wood so formed that the water pressure causes them to fit tightly against the grooves or shoulders of two contiguous piles, thereby preventing leakage. The grooves are of a rectangular form, and the lower extremity of the piece of wood has a double incline, "so that when driven into the ground " in the said grooves it is made of itself to press against the " back surfaces of the two grooves and the side surface of one " of them." In some cases the grooves and wooden pieces are so formed "that when the latter are in their places wedges " or packing pieces may be inserted, so as to press the piece " of wood against the back surfaces, or back and side surfaces " of the grooves, independently of the action of the water, or " the grooves and pieces of wood may themselves be made " with inclined surfaces, so as to produce a wedging action." The pieces of wood may be compressed before inserting them into the grooves.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1864, February 19.—No. 430.

JOHNSON, GEORGE HARDESTY.—"A new method of construct- " ing lighthouse towers, shot towers, chimneys, blast furnaces, " cupola furnaces, conduits, monuments and columns, grain " buildings, and buildings for storing crude and refined " oils."

"My improved method of constructing towers for light- " houses and other purposes consists in the formation of a

"cylindrical or other shaped tubular column of blocks of
"burnt clay, or any other suitable material or composition,
"so moulded as to have each a tongue on one side and a
"groove on the opposite side, and so arranged in combination
"that they will match together with iron bond plates and
"tie rods of iron."

"The same method of construction of chimneys, blast furnaces, cupola furnaces, conduits, monuments and columns, it will be understood, may be readily carried out by changing the design of the tube."

[Printed, 1s. 4d. Drawings.]

A.D. 1864, February 23.—No. 455.

HORSFALL, JOHN HENRY.—"An improved water economizer, "to be used in connection with fish ladders."

Hitherto the passages cut in the sill of the weir to attract the fish, continue to afford egress for water, when there is not sufficient water to run over the sill of the weir. The object of this invention is to obviate this waste of water.

A passage is cut in the sill of the weir and a door is placed therein. The door has a hinge at its lower edge as well as staples to receive a bolt. Staples are fixed in the weir sill (in a line with those in the door) to hang the bolt in, and, the bolt being passed through the whole of the staples, the door is thereby fastened. A chain and wire rope or rod is attached to the bolt. "By a lever of the first order, conveniently fixed "on the banks of the stream and connected with the wire "ropes before named, the bolt may be withdrawn and the "door allowed to fall, the water rushing through the passage. "After withdrawing the bolt the lever on the bank is at once "reversed. This operation causes the chain to which the "bolt is attached to become slack, and when it is required to "shut the door or trap the bolt resting in staples affixed "to the sill may readily be shot through those of the door. "The principle in working this apparatus consists in allowing "the door to remain open and the water to pass through only "so long as there is sufficient water to run over the sill of the "weir."

[Printed, 10d. Drawing.]

A.D. 1864, March 3.—No. 537.

STOCKMAN, Benjamin Pryor, and SCOTT, James Sheppard.
—" Improvements in constructing sea and river embankments, " walls, piers, and other structures wholly or portly immersed " in water."

The object of this invention is to dispense with "driven " or sunken coffer dams and excavated foundations within " them."

The inventors "form a foundation platform of iron, stone, " timber, or other suitable materials, supported upon and " securely fastened down to cylinders or piles or other suitable " supports, and made sufficiently strong and water-tight to " admit of the superstructure being erected thereon, and " resisting the upward pressure of the water. A tank dam " is to be attached to this platform, of which the platform " itself forms the water-tight bottom. By this arrangement, " a secure and dry chamber is obtained within which the " structure can be erected. As each section or length of the " structure is completed, the sides and ends forming the tank " dam may be removed, leaving the structure supported by " the foundation platform. In cases where the platform " might be liable to oxidation or rapid decay or required to " be removed 'relieving' or 'ground' arching or concrete " or stone blocks may be used in the lower part of the struc- " ture, which would form a sufficient foundation or support, " bearing directly on the cylinders or piles in the event of " the platform being entirely destroyed or removed."

Various modifications of the sealed platform and tank dam are shown in the drawings.

[Printed, 1s. 4d. Drawings.]

A.D. 1864, March 8.—No. 575.

SYMES, James.—" Improvements in pontoons or caissons " applicable to building structures in water and to other useful " purposes."

A pontoon or caisson is constructed about 100 feet long, 50 feet wide, and 30 feet deep, the bottom or flow consisting of a horizontal partition about 20 feet from the top of the pontoon; the lower chamber is therefore about 10 feet deep

and without a bottom. "A large circular or square hatchway "is made in the partition, and is provided with vertical "walls rising to the top level of the caisson, whereby "communication is established between the upper and lower "chambers." A valve in the hatchway closes or opens the division. The valve being closed, the pontoon is floated over the required spot. "The valve is then opened "and the water let into the upper chamber, which sinks "the pontoon to the bottom, say, to a depth of 20 feet, and "when the water in the upper chamber is on a level with "the water outside, the valve is shut and water is pumped "into the upper chamber until it is filled up 10 feet above "the level of the river or other water (and the upper chamber "must always be left so filled up 10 feet above the level "of the water), so that the 10 feet of water will cause a "downward pressure equal to counteract the upward ten-"dency of the pontoon caused by the withdrawal of water "from the lower chamber." The lower edge of the pontoon is thus driven down into the clay, and, the lower chamber being pumped dry, the work may proceed therein.

"The work being finished, water is let into the lower "chamber and pumped out of the upper chamber, when the "pontoon will rise."

[Printed, 4d. No Drawings.]

A.D. 1864, April 2.—No. 830.

HEAD, THOMAS HOWARD.—(*Provisional protection only.*)—"Im-"provements in the construction of reservoirs."

This invention relates to the prevention of the breaking of earth dams used for reservoirs.

"Now according to my invention I first make the face of "the dam smooth and level with a facing of clay, earth, or "such material, and then lie flat on such facing plates of "wrought or cast iron or lead or any similar material to "render such bank perfectly impervious to the water. I "prefer cast iron plates with flanges, either planed or caulked "with cement, and about half an inch thick, and I do not in "any way depend on such plates to resist the total strain of "the water, that being done by the earthwork, but I use them "to prevent the percolation and distribute equally the stain,

"it being well known that the smallest passage water may "make through a bank will certainly bring down the strongest "one. At the bottom of the reservoir I either drive a few "piles or build a stone or other approved foundation to "prevent the plates slipping down edgeways. I coat my "plates if of iron, with the composition used for preserving "iron pipes, or such approved composition as may effectually "preserve them from oxidization. I also lay small ordinary "drains of, say, 4″ draining pipes every 10 feet or approved "distance apart, in order that any slight leakage may be "drained off, and not effect the bank."

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 4.—No. 836.

STEPHENSON, George Robert. — (*Provisional protection only.*)—"Improvements in the method of levelling for and "forming the foundations either under or above water for "cylinders, piers, sea or river walls, and dams for bridges "& other structures."

"My invention consists of improvements in the method "of levelling for and forming the foundations either under "or above the water for cylinders, piers, sea or river walls, "and dams for bridges and other structures. For these "purposes I use cutters or jumpers working on a centre "previously fixed in the place to be levelled for the foundation, "or I use the centre itself as a cutter. The form and position "of the cutters or jumpers will be varied for use in rock or "in hard ground, and motion can be given to the cutters "or jumpers by means of steam or other power on a stage, "or on floating pontoons, or lighters, as may be convenient."

[Printed 4*d*. No Drawings.]

A.D. 1864, April 5.—No. 845.

DOUGLASS, James Nicholas. — "Improvements in con-"structing or framing lighthouses, hollow metal piles and "cylinders, and in framing other metal structures."

In constructing or framing the said structures, a series of quadrilateral frames or panels is employed; each frame is complete in itself, and is made of angle iron welded up so as to make a rigid frame. In cylindrical structures, the frames are curved to the radius of the cylinder. "In

" forming the structure the frames are put together edge " to edge so that the diagonals of each frame run longitudinally " and transversely of the structure. The sides of the frames " or panels are each of them rivetted or fixed to the side " of another frame or panel which is in contact with it, " and the angles of the frames so meet that their junctions are " perfectly fished, the angles of four frames meeting in a " point, and then one pair of frames serves to fish the other " pair, thus the sides form double ribs or webs crossing " each other and running continuously and spirally from " end to end of the structure in opposite directions." In taper structures the frames gradually decrease in size "as " the structure tapers away." To a framing thus constructed metal plating may be rivetted or otherwise fixed to the webs of the frames.

" In completing structures framed in the manner above " described, triangular frames are employed at the ends or " sides."

The drawings show this invention applied to the glazed portion of a cylindrical lighthouse lantern, to the side of a ship (in one case with horizontal plating, in the other case with diagonal plating), and to a girder.

[Printed, 1s. 8*d*. Drawings.]

A.D. 1864, April 20.—No. 980.

SHAW, John.—(*Provisional protection only.*)—" Improvements " in iron caissons, and in apparatus to be used in sinking the " same, and in sinking cylinders and piers for making foun- " dations under water."

These caissons have curved sides and flat ends with suitably-placed flanges. Projections at the ends of the caissons fit into each other and form a puddle box when put together, " and " the caissons are built end to end, and raised in tiers, with " water and air-tight joints bolted together, to the length and " height required."

A condenser or chamber at the top of the caisson receives air from an air-pump through flexible tubes. An opening between the chamber and the caisson enables the air to force out the water from the bottom of the caisson, and thus to sink the same to a firm foundation. The condenser is made with a valved hopper, that overhangs the caisson, so that the ma-

terial excavated may be discharged. A small cistern near the hopper is used to effect the discharge of water from the caisson and from the materials excavated.

"When the caisson is sunk down to a good foundation and "the bottom well puddled, the condenser is lifted off and "placed over the next caisson to be operated upon in a similar "manner, and so on with the rest in succession. The caissons "can be extended to any length, and are returned at right "angles when a cross dam is required, projections being made "on the broad side of the caisson to receive the ends of the "adjoining caisson, and form the box to receive the puddle."

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 21.—No. 1005.

JENNINGS, JOSIAH GEORGE.—"Improvements in the con- "struction of caissons, coffer dams, and similar structures "used when forming foundations under water."

In making the said structures, piles formed of corrugated sheet metal are driven side by side into the earth. Each pile is composed of two corrugated plates, rivetted together face to face, so that the ridges of the plates meet. The corrugations of the plate are in the direction of the length of the pile. A trough is placed, either permanently or temporarily, at the head of the pile, to receive a wood block which sustains the blows of the monkey. At the lower end of the pile a cast-iron shoe is fixed; the stem of the shoe is secured (by rivets or bolts) between the plates.

In connecting the piles, edge to edge, to make a coffer dam, the projecting corrugations of each sheet "are bent slightly "either inwards or outwards, so that projecting edges of one "pile may enter down between the corresponding edges of "the next pile." These interlocking edges may form guides for driving the piles, or guiding cheeks may be bolted to the last pile. The joints between the piles are made tight by filling the space enclosed by the projecting edges with clay.

"Caissons may also be constructed of corrugated sheet "metal, the sheets of metal being all connected together to "form the requisite caisson or tube before the caisson or tube "is sunk into its place, the lower end of the caisson would "then be forced into the earth in the usual manner."

[Printed, 8*d*. Drawing.]

A.D. 1864, April 22.—No. 1023.

NEWTON, WILLIAM EDWARD.—(*A communication from Louis Michel Breysse.*)—(*Provisional protection only.*)—"An improved "apparatus for supporting ships or vessels in docks or basins "while undergoing repair."

"The object of this invention is to dispense with the use of "the numerous props and struts usually employed for sup-"porting a ship or vessel in a vertical position and prevent "her from bulging while undergoing repair.

"To this end a kind of jointed framework or cradle is "placed in the dock, and the ship is floated into this cradle, "and when the water is removed from the dock the vessel "rests upon the cradle, the side pieces of which are moved up "to and made to press against and support the sides of the "vessel. The side pieces are moved forward by mechanical "means, such as by a rack-and-pinion motion, or by screws, "or by hydraulic power."

[Printed, 4*d*. No Drawings.]

A.D. 1864, May 4.—No. 1124.

POTTER, JOHN.—"A new compound or composition for "artificial stone," and "certain machinery or apparatus to be "used in mixing and applying the said composition."

1st head.—The application of a combination of sand and pulverised metallic iron to produce artificial stone or rock. The ingredients, when mixed, are moistened with water.

2nd head.—Among other uses, applying the artificial stone to constructing sea walls and strengthening embankments. According to one method, a chamber or caisson, fixed on the spot where the wall is to be erected, is filled with the composition. According to another method, a slight wall of hard material is supported by placing behind it a mass of the artificial rock. Embankments may be secured by coating them with the artificial rock. Another mode of strengthening embankments is to fill a trench (lengthwise of the embankment) with the composition, "which being wetted hardens into "rock." To make an artificial foundation, the composition is filled into an excavation of sufficient dimensions. To form blocks, boxes or moulds are provided.

3rd head.—"Machinery for conveying, apportioning, and "compounding the materials."

4th head.—The application of boxes or caissons for the purpose of giving form to the artificial stone, or of permanently retaining the same; the mixed and wetted materials are left to harden into a solid mass. The artificial stone may also be used as a substitute for piles; this is effected by means of tubes. The tubes have a loose tip and are driven into the earth, then filled with composition, and withdrawn; in some cases the tube may be left in the earth.

5th head. — "Producing the iron powder directly from "certain ores or oxides of iron."

[Printed, 1*s*. Drawing.]

A.D. 1864, May 13.—No. 1220.

LIDDELL, CHARLES.—(*Letters Patent void for want of Final Specification.*)—"Improvements in the mode of and apparatus "for constructing breakwaters, moles, and other under water "erections."

Blocks or large masses of masonry, beton, or concrete are used for the above-mentioned structures. To float these blocks to the spot prepared for their reception cellular caissons are used. Wrought-iron cellular boxes are connected together, by framing bolts, to form the walls of the caisson.

To deposit blocks of beton, "of a transverse section corre-"sponding to that of the sea wall which is required to be "erected," a temporary bottom is attached to the side walls of the caisson; in the mould formed by the side walls of the caisson and its bottom, the block of masonry or beton is built up. The caisson is floated to the place where the block is to be deposited, water is admitted into it to sink it, and the block contained in it is allowed to settle on the bed prepared for it. "The platform is then released from the caisson, and the "water being pumped out of the cells, the caisson is floated "off the deposited block." Another platform may be fitted to the caisson, another block moulded to it, and the operation repeated as described above.

In constructing a breakwater, the site is prepared by levelling it, or by first forming an embankment of stone "by tipping it "in the ordinary way of constructing embankments of 'pierres "perdues.'" The transverse blocks are then made, floated, and deposited as above set forth.

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 6.—No. 1404.

MIGOTTI, Girado.—(*Provisional protection only.*)—"An im-"
" proved means of clearing away and removing sand, mud,
" or other similar accumulations from dock or canal entrances,
" the beds of rivers, and such like places."

"A communication to be made by means of ordinary
" leathern hose, or india-rubber, or other suitable piping,
" from the surface of the water to the sand or mud requiring
" removal, the end of such piping on the surface of the water
" being attached to a common force pump similar to that used
" for extinguishing fires, an air forcing pump, or with the
" escape or safety valve, by steam blowing through from any
" available engine, a strong jet of water, or steam, or pressure
" of air being thus directed through the hose or piping to the
" accumulation it is wished to remove would immediately
" cause its suspension and rapid agitation in the water, and it
" would then be completely carried away by any current or
" tidal action within the sphere of whose influence it might
" then be brought, and the desired effect produced in a
" manner at once simple, inexpensive, and thoroughly effi-
" cient."

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 17.—No. 1511.

HODGES, James.—"Improvements in machinery employed
" in digging, raising, and treating peat and bog earth or
" soil."

A modification of the said machinery "placed on wheels
" may also be advantageously used in the construction of
" tunnels or of canals."

"The machine consists of a long rectangular vessel con-
" structed by preference of iron, so as to be water-tight, and
" capable of floating when placed on water. This vessel is
" decked over, or formed with suitable platforms or stagings
" to support the working machinery placed and fixed thereon,
" and which is actuated by suitable gearing driven by a steam
" engine or other suitable power carried by the vessel. At
" the fore end of the vessel one or more parallel rotatory
" cutter shafts or axes are applied, which are driven by the
" steam engine or other power; these shafts are capable of

" being raised or lowered, in order to regulate the depth at " which the peat or bog earth shall be cut." The cutters are spiral and a shield or boxing encloses them and confines the peat "when excavated until it is delivered by the scraper back " of the screw on to the deck of the barge." "The peat or " bog earth is next raised or moved by means of an endless " chain of buckets or carriers or by other mechanism to the " hopper of a machine, where the peat or bog earth is subjected " to pressure."

A propelling and steering wheel is arranged at the stern of the boat. "The wheel is provided with spokes in its circum- " ference arranged at suitable distances from each other resting " on the bottom of the canal; the wheel is geared to give " sufficient motion to propel the vessel at a suitable rate for " the excavators."

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1864, June 20.—No. 1530.

CROZIER, William.—(*Provisional protection only.*)—"Im- " provements in constructing and applying gates to docks, " locks, and other like structures."

"This invention has for its object improvements in con- " structing and applying gates to docks, locks, and other like " structures. For these purposes a gate for the entrance of a " dock or lock or like structure is constructed and the en- " trance to the dock or lock or similar structure is arranged in " such manner that the gate may be hung or turn on hori- " zontal axes or hinges at its lower part and shut against the " entrance of the dock lock or like structure; the gate in " opening outwards will be caused to sink and when open will " be wholly immersed in a horizontal position. It is pre- " ferred that the gate should be constructed of iron and be " hollow in order to obtain as much buoyancy as possible. " When the gate is to be opened it is filled with water and the " upper part is moved outwards so as to cause it to sink. " When the gate is to be closed the water is pumped out and " the gate is raised and closed by suitable gearing or tackle " aided by the buoyancy of the gate."

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 12.—No. 1738.

WOOD, William.—(*Provisional protection only.*)—"Improve-
" ments in means and machinery for 'warping' or covering
" land, bog, or peat with earth or soil, parts of which are
" applicable in raising or conveying soil or earthy matters in
" the formation and cleansing of canals, watercourses or ways,
" reservoirs, harbours, and docks."

For the gathering and lifting the inventor employs "a
" dredging or endless cutting or scraping and lifting apparatus,
" or suitable scoop wheel or revolving screw, actuated by
" steam or other power to lift the earthy matters into a
" holder." The earthy matters may be deposited in a hopper,
" from which they are removed continuously in measured
" quantity by a revolving wheel or screw into the mixing
" holder, or directly to the water in the pumping or lifting
" apparatus."

A locomotive engine may be used to move forward the excavating apparatus, a suitable tramway being formed. The engine may be a traction engine "or an endless railway
" engine."

When movable engines are used, whether on land or water, the earthy matters can be raised into the holder by means of a kind of plough or inclined plane, attached to the engine or vessel. "A revolving endless scraper or brush" is also used
" to raise or assist in raising the earthy matters up the
" inclined plane."

[Printed, 4*d.* No Drawings.]

A.D. 1864, July 26.—No. 1854.

HEATHORN, Thomas Bridges. — "Improvements in the
" construction of submarine and other foundations."

The drawings show a portion of a caisson "of an annular
" construction, the polygonal outline varying according to
" the formation of the superstructure."

The said portion "is floated out to sea exactly over the spot
" upon which the building is to be erected, and there
" anchored. Concrete is then placed in the caisson so as to
" cause it to sink equally, and as soon as the said portion of
" caisson is sufficiently deep in the water an additional height

"is added, and concrete placed therein to sink it deeper in "the water; this operation continues until a firm foundation "is obtained by the weight of the caisson, with its interior "filling of concrete, sinking through the mud or other soft "ground to the hard ground beneath. The interior is then "filled up with stones or concrete or stones and concrete, "upon which and the concrete the superstructure is erected. "Should the hard ground be of a shelving or sloping bottom "the caisson will only bear upon the highest side of same; "and to preserve the perpendicular of the said caisson, imme-"diately it touches the hard ground, stones are placed in the "interior of the caisson, which will naturally settle themselves "in such position as to form a wall underneath that portion "of the caisson which does not touch the hard ground, thereby "forming a foundation upon which the caisson may rest."

The drawings also show a fort erected upon the substructure. For a muddy bottom with no rock underneath, the bottom of the caisson rises up in a cone, and an inclined caisson may be used for a sloping bottom.

[Printed, 1s. Drawings.]

A.D. 1864, July 26.—No. 1863.

FURNESS, George, and SLATER, James.—"Improvements "in the construction of dredging or excavating machines."

This machine is "specially adapted for dredging and ex-"cavating large caissons, cofferdams, docks, and other "works."

A cast metal frame carrying two steam cylinders has three transverse shafts. On the end of the first shaft is a disc, the connecting rod of which gives rotary motion to the other shafts by means of spur gear. The third shaft has two pentagonal wheels, on which two endless bucket chains work. The whole machine rests upon wheels, and under its frame the ladder or telescopic frame is fixed. The ladder may be oblique or vertical. When a certain depth has been excavated in a caisson, the process may be repeated at a greater "depth by lengthen-"ing the ladder by means of the telescopic frame."

The buckets "have each a door working on a hinge next the "endless chains, and as the buckets pass over the pentagonal "wheel on the top of the machine the doors are forced open

"by the rotatory motion of levers fixed on the main shaft, thu "discharging the dirt, gravel, or clay into a shoot, and then "into a wagon, barge, or other receiver. The machine, wi "engine, boiler, ladder, and buckets, can easily be applied t "a barge or vessel, and will make a very compact and power "ful floating dredging machine."

[Printed, 10*d*. Drawing.]

A.D. 1864, August 16.—No. 2041.

STONEY, Bindon Blood.—"Improvements in the construc"tion of submarine works, and in the apparatus to be "employed therein, the same being also applicable to the "raising and transporting of heavy bodies."

1st. "A new mode of building quays, piers, walls, break"waters, lighthouses, and other works intended to be placed "in water."—These structures are made of blocks of masonry of much larger size than those heretofore used, "which are "first built on a convenient site, and then removed and "deposited in their proper places in the construction or work "in hand."

2nd. Floating shears for the transportation and manipulation of the above-mentioned blocks.—A water-tight barge has tanks or compartments which may be filled with water or emptied as occasion may require. Two pairs of shear legs and back stays are fitted on the barge, one pair projecting over one end, the other pair over the other or opposite end. From a crab, a chain passes over pulleys on the tops of the two shear legs. From one pair of shears the block of masonry is suspended; the chain at the other pair of shears carries a counterweight. The block is raised by the crab, the barge is kept from capsizing by suitably charging and discharging the tanks, and thus the barge and block are conveyed to their destination. Whilst the block is lowered to its place, water is allowed to escape from the further tank and to enter that next to it, in order to restore the balance. "The counterweight on the "chain will assist in working back the crab, and so draw up "the end of the chain again, and prevent slack."

[Printed, 8*d*. Drawing.]

A.D. 1864, August 24.—No. 2087.

GREAVES, Hugh.—(*Provisional protection only.*)—" An im-" proved apparatus for landing passengers and merchandise, " which apparatus is applicable also to other purposes."

" It consists in laying or forming on piles or otherwise, at " or near the shore level, a rail or tramway which may be " wholly or partially submerged, and in making use thereon " of a travelling stage or platform supported or carried by a " framework mounted on suitable wheels, and of such a height " as that the stage or platform may be above the water level " at all states of the tide." This stage conveys the passengers, and is furnished with a steam engine which imparts motion to the above-mentioned wheels, so as to move the stage as required. If the adhesion of the travelling wheels be insufficient, a vertical shaft on the platform carries a toothed pinion which gears " into a corresponding rack formed with " or attached to the rail or tramway throughout its entire " length." According to another plan, a drum or drums on the platform, wind themselves along a fixed chain. " In some " cases where the inclination of the shore is considerable" the inventor makes use of a " chain or rope fixed only at the " land end, and by means of the engine described," he winds " it up on to the stage or platform," or slacks it out as required.

[Printed, 4*d*. No Drawings.]

A.D. 1864, August 29.—No. 2118.

CAMPBELL, James.—" Improvements in floating docks."

This dock is adapted for the largest class of vessels, also, by means of trays or pontoons, for the next smaller class of ships.

The dock for the larger class of ships consists of twenty compartments (ten on each side of the keel), each composed, in vertical section, of a lower chamber, a balance chamber, and an upper tank. The shape of the inner portion of the dock fits, within a few feet, the midship section of the ship at the bottom. The external plating is parallel to the internal. The dock is sunk, for the reception of the vessel, by introducing water into the upper tanks, and risen by letting the water off from the same; the vessel is raised still higher by

placing caissons at each end of the dock, and allowing the water within the dock to sink into the lower chambers. When the vessel has been examined or repaired, the water is admitted to the inside of the dock, the caissons removed and the vessel floated out. Before taking another ship into the dock, the water is pumped out of the lower chambers into the upper tanks and the surplus water got rid of.

The above-mentioned caissons consists of water-tight thicknesses of plates with stiffening ribs, the floating power being confined to the top.

The form of the tray or pontoon above referred to is made to correspond to the shape of the lower part of the inside of the dock.

For repairing the dock an iron belt or trough is employed; by sinking the dock or by pumping water out of the end tanks, the trough may be fitted to the dock by a water-tight joint.

[Printed, 2s. 4d. Drawings.]

A.D. 1864, August 31.—No. 2142.

FURNESS, George, and MOORE, Lewis George.—"Improve-"ments in caissons employed in constructing embankment and "other walls, piers, breakwaters, and other like structures."

Each caisson is of an elliptical horizontal section. "Each "caisson is constructed, as heretofore, of a series of short "lengths or rings, which are connected horizontally by "flanges and screw bolts and nuts." In addition to these horizontal joints, each short length is formed of two halves, which go together by upright flanges. If the caissons are to form a permanent part of the work, the inner halves above the permanent structure may be removed, "whilst the outer "halves or parts are allowed to remain, in order to present "an arched coffer dam to prevent the water from getting to "the interior whilst the work is being carried up, more or less "resting on the foundation or parts of the foundation formed "by and in the lower and permanent parts of the caissons. "In some cases wood or other piles are driven in the angular "spaces where the upright flanges of two neighboring caissons "come together, in order to give support, and render the "junction water-tight when the inner halves or parts of the "caissons have been removed. The upright flanges may not

" only be used for connecting the two parts or halves of a " short length, but they may also be used for connecting the " neighboring caissons together vertically."

[Printed, 1s. 10d. Drawings.]

A.D. 1864, October 20.—No. 2593.

SHAW, JOHN.—"Improvements in cofferdams, and in appa-" ratus to be used therein, and in sinking cylinders and tanks " for making foundations under water."

The object of this invention is to facilitate the above-mentioned operations, "also to economise labor in raising and " discharging the soil or materials excavated, and at the same " time dispense with the use of pumps for drawing off the " water."

The nature of this invention "consists in forming iron " caissons with curved sides and flat ends with flanges on the " top and bottom of all the upper caissons and flanges on the " top only of all the bottom caissons." Projections from the caissons form a puddle box when put together. By longitudinal and vertical joints, that are water and air-tight, the caissons are put together to the length and height required. By means of a removable condenser or chamber at the top of each caisson, which is supplied with air, the water is forced out from the bottom of the caisson, and it (the caisson) is thereby sunk down to a solid foundation.

The chamber overhangs the caisson, pier, or cylinder "to " effect the discharge of the soil through the hopper."

A small cistern, near the hopper, and connected thereto by a short pipe having a stop-cock, receives the water drained from the materials in the hopper.

When each caisson is properly sunk and fixed, the condenser or chamber is placed over the next caisson, and so on, in succession.

"The caissons can be extended to any length, and are re-" turned at right angles when a cross dam is required, pro-" jections being made at the broad side of the caisson to " receive the ends of the adjoining caisson, and form the " box to receive the puddle."

[Printed, 10d. Drawing.]

A.D. 1864, October 21.—No. 2603.

GWYNNE, JAMES EGLINTON ANDERSON.—"Improvements in "the construction of centrifugal machinery applicable to "pumps, fans, turbines, and similar apparatus, and in the "applications of such machinery."

The fourth part of this invention relates to centrifugal pumps with a vertical axis; it "consists in constructing the "disc or revolving wheel with a long neck to allow for wear, "and in the application to the under side of such disc or "revolving wheel of a screwed end or termination forming a "species of boring or earth loosening tool, which may be "either permanently or temporarily attached to the disc or "wheel." The earth loosened by this means is drawn up into the pump "and elevated thereby in company or not with water "as the case may be." The rotary motion of the water &c. is checked by a baffle plate.

"When a pump or machine of the description above men- "tioned is intended to be used for making excavations under "water, in the making of sea walls or harbour works, remov- "ing accumulations from docks, harbours, and rivers, for "raising sunken ships, or removing water from foundations, "removing material in the sinking of cylinders, caissons, or "other like structures, it is proposed to so arrange the pump "or machine that it may be capable of being readily raised "or lowered, or the length of the vertical discharge pipe "increased or diminished as required, either by the aid of "telescopic, sliding or other joints in the discharge pipe, thus "affording facility for lowering the apparatus to and working "it at any desired depth below the surface."

[Printed, 1*s*. Drawing.]

1865.

A.D. 1865, January 14.—No. 125.

BOURNE, THEODORE.—(*A communication from William Smith Sampson.*)—"Improvements in fog and storm signals, buoys, "*and* spindles."

The outline of the buoy, in combination with the ballast, is such that it will be upright when at rest; it is easy in the water during violent movement of the waves and slight movements of the water rocks it from side to side. The top of the buoy is formed so that water may readily run off the same. An elliptic shaped spindle is framed on an iron shaft which passes through the centre of the buoy and is stepped at its bottom. A large bell is hung on the top of the spindle, and the buoy is moored by means of "an iron strap so connected "with the framework of the buoy that the buoy itself acts "with perfect freedom without fouling. This strap also "connects with the buoy in such manner that the impinge-"ment of current or wind has no tendency to keep the buoy "out of its vertical position. This strap is connected by a "chain with an anchor at any depth of water required."

A panelled winged beacon with a conical-shaped base is shown in the drawings.

[Printed, 8*d.* Drawing.]

A.D. 1865, January 20.—No. 174.

BALMA, LOUIS.—"An improved machine for raising and "carrying earth, sand, stones, or other similar solid or liquid "materials for dredging, ventilating or winnowing grain or "other analogous purposes."

Amongst the purposes for which this machine may be used are:—"Dragging sand from the beds of canals, rivers, and "other watercourses, for cleansing the bottoms of seaports, "basins, and reservoirs."

The machine consists of a frame that is composed of two strong girders, kept parallel to each other and at the required distance apart by means of cross stays. For the convenience of transport the frame has two pairs of wheels, by means of which it can traverse roads to any destination that may be required. In use, the frame is kept in an oblique position by means of a leg or prop; this prop is ordinarily folded against the frame by means of a hinge. Motion is given to the machine thus placed by any suitable motive power that actuates a pulley at the lower part, and thence certain rods and levers. Brackets are fixed on the girders, at suitable distances, and support the pivots of levers that are connected with buckets. The buckets are divided into two sets; the first set comprises

the first, third, fifth, &c. buckets, and the second set comprises the second, fourth, sixth, &c. buckets. The buckets are worked alternately, so that the material in all the odd buckets is conveyed into all the even buckets, then the even buckets discharge their contents one step higher into the odd buckets, and so on.

"If the machine is used for dragging, a kind of rake may " be placed at the lower end, in order to facilitate the working " of the first trough which takes up the sand."

[Printed, 10*d.* Drawing.]

A.D. 1865, February 6.—No. 321.

MARKHAM, Clements Robert. — (*A communication from William Graham McIvor.*)—"A new method for removing or " destroying the momentum of heavy bodies by means of an " elastic machine or machines, so as to prevent injury and " damage from concussion, applicable to ship cables, ship and " fort armour, railway trains, tenders to pier heads and floating " piers, gangways, breakwaters, and other similar structures, " also as a motive power."

This invention consists in the application of coiled springs, chains and drums to the above-mentioned purposes.

The two parts of a gangway for communicating between ships and pier heads, slide on each other in a telescopic manner, and the spring barrels are applied so as to contract the length of the platform. The seaward end of the gangway is furnished with a pivoted flap; small spring barrels tend to maintain its position in line with the platform. A cushion or pad eases concussion with the ship. Mooring buoys having a spring barrel may be placed in roadsteads.

In applying this invention to breakwaters, floating harbours, and pier heads, these structures are made so as to give motion at short distances, and thus rise and fall with the waves. A fixed pile pier extends beyond the surf, and is connected with a floating harbour by two elastic gangways; the harbour is moored by elastic cylinders. To allow of freedom of motion of the framework, its beams are connected by a powerful loop joint.

[Printed, 2*s.* 8*d.* Drawings.]

A.D. 1865, February 10.—No. 380.

NEWTON, William Edward.—(*A communication from Frederic Glover.*)—"Improvements in the formation of embankments, " sea walls, breakwaters, and other similar constructions."

A framework, "consisting of long baulks of timber connected " together with cross-pieces, or a framework of wood and iron " is constructed and sunk on the spot where it is desired to " form the embankment or other work, care being taken that " the framework is firmly fixed on the ground and prevented " from sinking in. This spot must be in some situation where " the wash of the sea is continually moving about the sand, " shingle, or earthy matters, the main object being to catch " these earthy matters and keep them stationary in one spot. " By the motion of the waves the sand and earthy matters " will be washed over the framework, and in a short time will, " by accumulating, fill up the spaces between the baulks of " the framework. When this is done a second framework of " similar construction must be sunk on the first and firmly " secured thereto; but the sea face or outer side of the second " framework must be a little in the rear of the first, so that " the face may be formed at the proper slope to resist the " action of the waves. When this second framework has " become filled by the silting up or accumulation of sand and " earthy matters, a third framework must be sunk and secured, " and then a fourth, and so on, until, by continual accumulation of the earthy matters the embankment is raised to about " high water mark. Care must be taken that the sea front of " every successive framework shall be a little in the rear of " the framework immediately beneath it, so as to preserve the " proper slope."

[Printed, 10*d*. Drawing.]

A.D. 1865, February 11.—No. 387.

ATHERTON, Charles, and RENTON, Amherst Hawker.—"Improvements in buoys, beacons, floats, or pontoons, which " improvements are also applicable to floating bodies generally."

This invention relates to the construction of the above-named floating bodies "in such manner that they shall be rendered " permanently buoyant or unsinkable however damaged by

" any casualty; and this we effect by using in their construc-
" tion a quantity of suitable composite material or substance,
" the mean specific gravity of which shall be less than that of
" water. The composite material which we prefer to use is a
" mixture of cork or other light bark, light woods, or other
" natural or artificial substances of small specific gravity
" suitably prepared for intimate incorporation with bitumi-
" nous, resinous, oleaginous, or such other adhesive matter
" which when combined therewith shall form a mass imper-
" meable to water, and of a mean specific gravity less than
" water, and such that when placed in the interior of the
" floating body shall cause it (howsoever perforated or damaged
" by collision or otherwise) to preserve its buoyancy under
" the casualties to which floating bodies are subject at sea."

The drawings show a vertical buoy filled with the buoyant material and having ballast, also an ordinary buoy similarly packed. In a beacon, the hull is filled with buoyant material. A floating light is also shown having its hull packed with buoyant material.

[Printed, 8*d*. Drawing.]

A.D. 1865, March 3.—No. 597.

MANWELL, David, and MANWELL, James.—" Improve-
" ments in driving piles and in apparatus therefor."

" When a line or wall of piles has to be driven, long gauge
" or main and guide piles are first driven at regular intervals,
" such that the spaces or bays between them will receive a
" moderate and convenient number of what are termed sheet-
" ing piles."

" The five or other number of piles to fill up each bay are
" driven simultaneously, being fixed together by hoops, dowels,
" and dogs, and being fitted with one knife-edge shoe extend-
" ing across the bottoms of all the five piles. This mass of
" piles is driven in with comparative ease and certainty, being
" guided at both sides by the gauge or main piles, whilst the
" clay or soil is displaced towards the front and back only,
" whereas when one or two piles are driven without being
" guided on both sides, the soil at the open side is displaced
" partly in the line of piling, which renders the driving of the
" next pile more difficult."

"The pile-driving machine is of course made of increased
" power suitable for driving the mass of piles, and the ram or
" falling block is made large enough to strike the heads of all
" the five or other number of piles composing the mass, whilst
" a double-cylinder engine without fly wheel is used for work-
" ing the machine instead of the single cylinder and fly wheel
" used with the common machine."

[Printed, 10*d*. Drawing.]

A.D. 1865, April 10.—No. 1017.

GHEERBRANT, CHARLES FRANÇOIS.—(*Provisional protection only.*)—"An improved mode of and apparatus for deepening
" the bottom or bed of rivers, canals, harbours, or other similar
" places."

"The apparatus consists of a sort of moveable dam or breast
" wall constructed of timber or other suitable material, and
" sufficiently strong for resisting the impetus of the water,
" and provided with the necessary means for allowing the
" dam to be fixed by posts, anchors, or other similar means at
" any spot where the bottom or bed is to be deepened, suitable
" open spaces being left between the lower edge of the dam
" and the bottom or bed for the purpose of causing the water
" in passing through these open spaces to be forcibly obliged
" to impinge on and deepen the bed or bottom, and by the
" powerful current thus obtained carry along with it gravel,
" sand, mud, or other similar obstructions, whilst after having
" thus procured the required depth of water the dam is re-
" moved to another spot where the same operation is again to
" be performed.

"The dam may be provided with folding or other doors,
" and with the necessary means for allowing certain parts of
" dam to be folded or flapped together, or partly taken to
" pieces, and thus render the entire more manageable for
" transporting the dam from one spot to another."

[Printed, 4*d*. No Drawings.]

A.D. 1865, June 5.—No. 1533.

DE BERGUE, CHARLES.—" Improvements in the manufacture
" of iron piers or erections, applicable more especially for
" carrying bridges at high elevations, or available for sheer
" legs and lighthouses."

"My improved foundations consist of a combination of cais-
" soon arrangements of cylinders or of iron plates to form
" caissoon cylinders or chambers for sinking into the ground,
" the combined structure being narrowed or tapered in dimen-
" sions from the base upwards, and such narrowing or taper-
" ing being effected by the several lengths of separate caissoons,
" which are secured one upon another, being themselves
" tapered, or if cylindrical or uniform each in itself, then the
" several caissoons being successively of smaller diameter or
" dimensions so as to produce the general tapering by a series
" of sets-off or steps.

"My improved superstructure to be erected on the improved
" or other foundations consists in combining into a structure by
" ties or struts, or by both ties and struts, two or more com-
" pound columns or pillars of the following specific character or
" features, the said columns not standing vertically but being
" wider apart at the base than above, and nearing each other,
" reckoning from the base upwards, and in some instances
" uniting at the top, for which purpose parts of the columns
" are removed, or are not required to be constructed so that
" they may lie and fit properly against each other. The said
" character or features of the columns consists in their being
" constructed with three or more principal ribs or vertebra
" connected together with ties and struts on the lattice prin-
" ciple on each face or side, so as to form lattice columns with
" three or more sides."

[Printed, 1s. 6d. Drawings.]

A.D. 1865, June 24.—No. 1692.

TURTON, George.—(*Provisional protection only.*)—"Improve-
" ments in floating docks."

This invention "consists in the employment of a series of
" air or float cases, built and arranged separately or in loose
" portions, and running along the upper part of the sides of
" the dock from stem to stern, also in fitting hinged gates or
" a caisson to close the dock, and in the general arrangement
" and construction of floating docks," "whereby the dock can
" be propelled or sailed at an equal speed to any ordinary
" vessel."

The docks are constructed of steel, iron, or wood, with floors,
ribs, or cross girders, either of solid plates, trellis, or webs,

with angle iron reverse bars, running from the keel to the top of the side frames. Inside the dock, and at the two sides, there are iron or wooden steps, staging, and platforms. The dock is provided with all necessary cocks, sluices, and valves. The floors are arranged with opening gutters to allow the water to run freely to the pumps. The shell of the dock is constructed of strong plate iron up to the turn of the bilge, and above that of thin sheet iron to form air compartments. Bulkheads are used "about every twenty feet for strength and safety in case "of collision. The deck may be strengthened if required with "keelsons in the bilge or floor, or at the sides, stayed and "supported by stanchions from the frame underneath the air "boxes inside to the floor; such vessel to have a flat bottom. "After a vessel has been floated into the dock, the gate or "gates is or are closed and the water pumped out, when the "vessel within will gently take the blocks, and being properly "shored upon, will remain safely. The dock with its vessel "will ride at ease in stream, tide, or sea-way. When docked, "the bottom of the vessel will be below the water level out-"side the dock."

[Printed, 4*d*. No Drawings.]

A.D. 1865, July 3.—No. 1755.

DEANE, Edward.—(*Provisional protection only.*)—"Improve-"ments in tubular structures, rendering them specially appli-"cable for ships' masts and building purposes."

Constructing lighthouses is mentioned as one of the purposes to which this invention is applicable.

The structure consists of a tube, in the centre of which is an upright rod or axis, from which radiating stays proceed, so as to strengthen the building. The axis itself may be a tube, or a number of smaller upright tubes may be within the outer upright tube. In the construction preferred, upright sky plates are employed; these may be composed of a number of boiler plates fastened together so as to form in effect one plate. One out of three of these upright plates occupies the whole diameter of the tube, and projects slightly beyond it for the purpose herein-after described. "The other two upright "plates make each a semi-diameter, and are secured to the "first-named plate at right angles; all these plates being "fastened together by angle plates and bolts or rivets, by

" which means a strong centre or core is secured. The outer " part of the tube is composed of four segmental pieces, " which have flanges having the projecting parts of the upright " stay plates tightly secured between them by means of bolts " or, rivets through all of them. It is obvious that, instead " of three stay plates, four, five, seven, or other convenient " number might be adopted."

The inventor prefers to employ good steel in these structures, "although iron or other hard metal may be used."

[Printed, 4*d*. No Drawings.]

A.D. 1865, July 12.—No. 1838.

McKEEN, THOMAS CATO.—Among other subjects, this invention relates to raising docks.

This invention "consists in furnishing the vessel, of what- " ever description, with a strong metallic vessel of a suitable " capacity which will serve to contain condensed air. The air " is to be forced into this vessel by suitable air pumps, operated " by the engine or by manual power before the vessel starts " on her voyage, or any time during the voyage, so that the " condensed air will be ready for use at the appropriate time. " With this vessel or air receiver is connected a strong pipe " or main, and to this main are attached at the required in- " tervals along its line branch pipes of any flexible material " found best adapted to the purpose, which communicate with " bags or buoys," "each branch pipe being provided with a " faucet, by turning which the air can either be admitted into " or excluded from the particular buoy to which the branch " pipe leads; and it further consists in connecting with these " bags cords or chains, which are attached to the side of the " vessel, and arranged in such a manner that these buoys can " be thrown over the stem and stern and sides, and be " brought under and near the keel while in an uninflated " state, and while in this situation can be inflated simulta- " neously, or one or more at a time, so that the vessel may be " elevated horizontally, or in that portion where she lies " deepest in the water, and in a few minutes so as to decrease " the draught sufficiently to permit it to float over the bar or " whatever may be the obstacle in its course in perfect " safety."

[*Printed*, 8*d*. Drawing.]

A.D. 1865, July 18.—No. 1870.

WOOD, Thomas Ward.—*Provisional protection only.*—"Im-
"provements in the construction or arrangement of sluices or
"dams."

The said sluices or dams are used for storing or guiding tidal waters in or into dams, reservoirs, or water-power machines. Two apertures are formed in a wall or apparatus, each with a sluice on each side thereof. Each sluice may be opened and closed at pleasure. A chamber between the two apertures forms part of a water-power machine, whereby the inner lower sluice is opened. At the same time the outer lower sluice is closed, and also the upper inner sluice; the upper outer sluice is opened at the time the tide is rising, and the water from it drives the motive-power machine forming part of the chamber "until the tide attains nearly to its
"highest point, when the open shutters or sluices will be
"closed, and the outer shutters or sluices will be opened, the
"motive-power machine will then be driven by the water
"previously admitted through the machine, the water re-
"turning again through the machine as the tide falls, the
"water passing through the machine the same way both
"during the rising and falling of the tide."

Sometimes the inventor employs "an additional shutter or
"sluice or additional shutters or sluices for emptying the
"dam or reservoir which has received the water during the
"rising of the tides."

[Printed, 4d. No Drawings.]

A.D. 1865, July 29.—No. 1967.

BAKER, Valentine.—"Improvements in applying and utilis-
"ing water power."

According to the first part of this invention, a syphon is employed; the syphon "is made to bridge over a dam or
"embankment built across an estuary or reservoir subject to
"tidal variation of water levels. On one or both limbs of the
"syphon is fitted a turbine, which will be driven by the flow
"of the water through the syphon from the higher to the
"lower level on opposite sides of the dam or embankment."
Another plan consists in having a curved or bent pipe, or inverted syphon, or waterway constructed under the dam or

embankment; this is provided with a turbine at one or both ends. In some cases, two or more dams are employed. This part of the invention is applied to docks. The difference of tidal level is used "for the working of turbines or water "engines, and the compression of air by them." The power thus available is used "for discharging the cargoes of ships "and for other useful purposes," or the water may be made to "act directly upon other hydraulic engines by means of "force pumps and accumulators."

The other portions of the invention relate to motive power either from water or air pressure.

[Printed, 8*d*. Drawing.]

A.D. 1865, August 22.—No. 2162.

JONES, DERWAS OWEN.—"An improved apparatus to facilitate "the cleansing and examination of the bottoms of ships and "other submerged structures."

This apparatus consists "of a waterproof frame with elastic "joints, and with a flexible face, closed at bottom and open "at top." The inventor uses "in conjunction with the water-"proof frame levers or beams, shaped in accord with the "contour of the particular structure and part to which the "frame is to be applied, which levers on being pressed against "the back of the frame cause it to assume a form corresponding "to that of the structure." An india-rubber tube is intro-"duced in the face of the frame," and more or less air is forced into it. "To use the apparatus bring it in contact with "the structure to be cleansed or examined, pump out the "water from the inside thereof, when a tight chamber will "be provided, in which men may safely descend and work."

[Printed, 8*d*. Drawing.]

A.D. 1865, August 24.—No. 2173.

MOODY, JOHN.—"Improvements in floating lights, beacons, "floating batteries, and other vessels."

"The object of this invention is so to construct a floating "vessel that it may remain comparatively steady on a rough "sea, when a vessel of ordinary construction would roll "violently." For this purpose the vessel is made "of a star-"like form, with four or other number of arms. It is made "with a flat bottom, and over it is a deck arched in all direc-

" tions." When the vessel is to be employed to carry a light or a beacon a tower-like erection is made " at the centre of " the structure, in which may be any doors and windows " necessary for the convenience of the crew; in all other " places the arched deck has no opening made through it, or " should such openings be required they are arranged so that " may be securely closed." The arched form of the deck in " the floating light, or beacon, or telegraph station, will " deflect the waves which break on it, and will not oppose " any great resistence to them."

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1865, September 15.—No. 2364.

LAW, HENRY.—(*Provisional protection only.*)—" Improvements " in caissons for closing the entrances of docks and canals."

The caisson is placed against the external face of the dock entrance, the relative positions of the centre of gravity and the centre of displacement being so adjusted " that the caisson " shall float with its inner face inclined towards the dock " entrance at the top, and away from it at the bottom;" by this arrangement the bearing surfaces of the caisson do not lodge upon the dock sill. To the two upper corners of the caisson, upon its inner face, are attached two powerful hooked instruments. Upon each entrance pier of the dock, recesses are constructed to receive the said hooks. " These parts are " so adjusted that when the caisson is placed across the dock " entrance, and in contact at the upper parts with the same, " the hooks or instruments shall be vertically above the " recesses in the piers. Upon admitting water into the body " of the caisson to sink it, these hooks or instruments will as " it descends enter the recesses in the piers, and so connect the " caisson and the piers of the dock entrance in such a manner " that the former becomes hinged to the latter, and the further " sinking of the caisson by the continued admission of water " into it causes the caisson to assume a position less and less " inclined to the piers, until it finally comes into contact " with the piers and the sill or lower portion of the dock " entrance, and thus effectually closes the same. Suitable " packings, such as vulcanized india-rubber, are applied " between the contact surfaces."

[Printed, 4*d*. No Drawings.]

A.D. 1865, September 19.—No. 2387.

CLARK, Edwin.—(*Letters Patent void for want of Final Specification.*)—"Improvements in floating dry docks."

This invention relates to a modification of the platform described in No. 159 (A.D. 1857), and in the pontoons used in connection therewith.

Instead of using separate girders as in the said former Specification, the girders and platform are combined into a strongly framed rigid platform, on which vessels may be directly raised by the hydraulic presses with or without the use of a separate pontoon. The girders of this platform run transversely, and are extended beyond the lines of columns. Iron frames are erected on the base thus obtained to the height necessary to allow of placing shores from them to the vessel. Iron blocks are attached to these frames; the said blocks have faces which form steps for the shores. The said rigid platform may be enclosed with plates so as to form a water-tight pontoon, "so that when it is raised out of the "water with the vessel blocked upon it, and emptied either "by means of valves in the bottom," as described in No. 159 (A.D. 1857), "or by pumps provided for that purpose, it may "be capable of wholly or partly supporting the vessel, thus "relieving the presses of the whole or the greater part of the "weight of the load they have raised." The inventor proposes "to use the above system of framed steps or altars not "only in conjunction with the floating rigid platform as above "described" but also upon his "ordinary pontoons as at "present in use."

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 25.—No. 3031.

FERRIER, John.—(*Provisional protection only.*)—"Improve-"ments in the hulls and tackle of navigable vessels, and in "the gear for propelling the same by wind and steam or other "motive power engine, and clearing the same from water, "and in apparatus connected therewith, to enable the said "vessels to be converted into floating graving docks or lifts for "raising vessels and other submerged or partially submerged "heavy bodies to or above the surface of the water."

1st. A vessel which may be [illegible] hull with double bottom and sides. The [illegible] is placed between the sides of the vessel. The [illegible] vessel are formed by movable pontoons.

2nd. "The use of iron or steel [illegible] "shrouds."

3rd. Using twin screws [illegible] enclosed screws that act as pumps [illegible] and double sides of the body of the vessel from water [illegible] the vessel is used as a floating graving dock [illegible] deck, and deck beams are removed and the [illegible] bow and stern are floated away. The vessel [illegible] to the depth required to allow the [illegible] between the sides. The rotation of the [illegible] acts to drive out the water, the remainder [illegible] expelled by pumps.

When this vessel is used for [illegible] the same are shored up between the [illegible] it is again desired to float the [illegible] is re-admitted into the hollow bottom and sides of [illegible] until the same sinks sufficiently to [illegible] floated off the lift.

[Printed, 4d. No Drawings.]

A.D. 1865, December [illegible]

LIDDELL, CHARLES, and [illegible]

"Improvements in constructing and [illegible] "tures."

"This invention relates to the [illegible] "bodies which are intended [illegible] "(suitable, for example, for [illegible] "proximity to land shoals or [illegible] "mooring of the floating bodies [illegible] "permanently submerged at a [illegible] "the waves."

The floating structure is made [illegible] weight of the superstructure [illegible] framing carried above the action of [illegible] floating structure is anchored [illegible] "or sunken weights by means of [illegible]

" chains attached to the float so as to allow it to move laterally " when acted on by currents, and at the same time maintain " its horizontal position."

The mooring chains are worked "by means of winches, " hydraulic presses, or other arrangement, so as to allow " of the adjustment of the level of the float, and the raising " or lowering of it." When using hydraulic presses, a cylinder to each mooring chain being provided, the cylinders are all connected with one pump, "so as to obtain, when " required, simultaneous action and equal tension on all the " mooring chains or cables."

[Printed, 6*d*. Drawing.]

A.D. 1865, December 22.—No. 3314.

DEANE, EDWARD.—" Improvements in pipes, tubular columns, " and hollow structures for masts, oars, shear legs, life boats, " and ordinary boats, for water, gas, and waste water pipes, " and for other similar constructions where great strength is " required."

One part of this invention relates to the construction of lighthouses.

This invention consists in constructing the above-mentioned structures of sheet iron or steel so as to " add very greatly " to their strength." Lighthouses and " towers of observa- " tion" are mentioned as being formed according to this invention.

A tube is made " round, square, oval, or of any other shape " to suit the purpose for which it is intended." This tube (of sheet iron) has a web or webs in its interior. " These are " bolted or rivetted in the usual way to each other and to " the external tube either on the inside of the tube or to " flanges on the outside. There may be any number of webs, " but two, three, or four will be generally found to be suffi- " cient." In another plan, radiating stays may proceed from a tubular or solid core or axis, " the said stays being securely " fastened to the external tube." A sheathing or filling of wood may be employed in some cases.

[Printed, 10*d*. Drawing.]

1866.

A.D. 1866, January 20.—No. 190.

GEDGE, William Edward.—(*A communication from Lëonard Goursseau, junior.*)—" An improved construction of careening " basin or graving dock."

This dock has rapid immersion and emersion. "The " method adopted by the inventor is based upon the use " of tubes of sufficient dimensions to give the power re- " quisite for raising the weight of the ship to be repaired."

A grating is placed upon the keels of the dock. Sheet iron framings fitted on the grating, receive and support the said tubes, which are of sheet iron. The basin of the dock has a deck, and from the basin rise two caissons, one on each side. The tubes are horizontal and are provided with funnels that communicate with the upper platform or mid-deck of the caissons. Pistons with the tubes are worked by means of trestles, pulleys and chains.

" The principle of this invention is based upon an assemblage " of sheet iron tubes supporting a bottom and an openwork " flooring or lower deck, which can be immersed without any " resistance when the piston is drawn along within the tube, " so that it fills with water, and which emerges so soon as " the piston driving out the water causes a vacuum, the " water introducing itself into the tubes, giving weight to " the detriment of the resistance drawn from it by the piston, " and regaining its power under the action of the piston " which forces out the water and restores the vacuum and " the power which was lost."

The dock has a bow or stem; there are dock gates at the stern.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, January 29.—No. 286.

ROBERTSON, James. — "Improvements in machinery for " cutting, excavating, sinking, dredging, and cleaning water- " courses, basins, channels, foundations, and roadways, such " improvements being also applicable to other similar pur- " poses."

The principal points in this invention are:—

1st. For the above-mentioned purposes, the use of currents of water or air propelled at high speeds; the construction and use of rollers for carrying off excavated materials; also the arrangement and use of rotary wedge-formed cutters or rollers for the sinking of channels.

2nd. Open mouth-pieces or conduits. An open side of the conduit receives the earth or other material which is acted upon by forced currents of water or air passed through the conduits from end to end. The earth is thereby ejected from the exit end of the conduit or tube. A jet of steam may be used. The drawings show this part of the invention combined with an ordinary dredging machine.

3rd. To convey the excavated material out of the way, large hollow cylinders, made water-tight, and buoyant in water, are employed. It is "chiefly for a means of using dredging "machinery that this cylinder conveyance is designed to be "employed."

4th. Rotating wedge-formed cutters or rollers are used for "the sinking, rolling, or forming narrow channels or drains "in the ground, such as are used for the purposes of irrigation "and drainage."

This invention is set forth in much detail by the help of a voluminous Specification, and a number of drawings.

[Printed, 6s. Drawings.]

A.D. 1866, March 8.—No. 704.

SCHOONMAKER, SYLVESTER FRANKLIN.—"Improvements in "dredging and elevating machinery."

"The said improvements consist, first, in the mode of sup- "porting the bucket or scoop from the end of the jib or boom; "second, in the means whereby the said scoop is operated to "fill and empty itself; third, in the means for adjusting the "jib or boom in any required position to control the operation "of the scoop while digging; fourth, in the construction and "arrangement of the winding machinery by which the scoop "is raised, lowered, and operated to fill and empty itself; "fifth, in the means for stopping and holding the boat in "any desired position without the employment of anchors or "cables."

A boat, or screw, properly ballasted, supports the derrick posts and other parts of the machinery. Chains connect the jib with the top of the derrick posts. Two spars to support the bucket frame slide vertically in eyes secured to the jib. The bucket is formed in two parts hinged together. Pulleys in connection with short chains are attached to the bucket frame, and being acted upon by the winding apparatus, collect the mud, and open to deposit it at proper times. A curved platform on the front of the deck is furnished with palls; these serve to hold in any required position the foot of a strut that is jointed to the top of the derrick post and secured to the jib. The winding machinery for operating the scoop consists of two barrels supported in a suitable framing and operated by steam or other motive power. "The boat is stopped and held " in any desired position by means of an iron shod or pile, " which passes into the ground through a box or tube exten- " ding up from the bottom of the said boat, and which is " raised when required by a rope or other suitable means."

[Printed, 1*s*. Drawing.]

A.D. 1866, March 19.—No. 810.

GEDGE, William Edward.—(*A communication from Emilio Musciacco.*)—(*Provisional protection only.*)—" A new or improved " pneumatic steam dredging machine."

A boat to generate steam is employed, in connection with a hopper boat, to raise the sand or mud from the bottom of the water. The steam-generating boat has elbow pipes, one extremity of which is fixed to a cock on the hopper boat. The hopper boat has suction tubes, one on each side, also an air tube, and a lower sluice for delivering the collected material.

The hopper boat is anchored astern of the steam boat, the steam from which passes into the hopper boat, by the before mentioned elbow pipes, until the hopper boat is filled with steam. On the air cock of the hopper boat being closed, the steam condenses and produces a vacuum in the hopper boat, thus causing the mud, sand, and gravel to rise into the hopper boat through the suckers. The cords, chains, and tubes of the loaded hopper boat being detached, it leaves for the spot where it is to discharge its load, and another is attached to the steam boat and loaded in a similar manner.

[Printed, 6*d*. Drawing.]

A.D. 1866, March 20.—No. 816.

KING, Henry.—"Improvements in the construction of coffer-
" dams."

The objects of this invention are to construct cofferdams of great strength, and economical in cost.

1st improvement.—Driving a single row of piles diagonally. " Walings are fastened on these diagonal piles both back and " front and opposite each other, as at present practised in the " construction of cofferdams."

2nd improvement.—Covering the said diagonal piles on the outside with sheets of zinc, lead, or copper, for making the cofferdam impervious to water.

3rd improvement.—Dredging outside the diagonal piles to a sufficient depth, and filling in the same with well punned clay. "The bottom of the sheets of zinc, lead, or copper, or " other suitable metal covering the diagonal piles" "will be " curled into the body of the well punned clay."

4th improvement.—"Securing and fastening longitudinal " connecting timbers from point to point of the external " angles of the diagonal piles."

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1866, April 7.—No. 995.

SCOTT, Thomas.—(*Provisional protection only.*)—"Improve-
" ments in sinking tubes, cylinders, or caissons for the foun-
" dations of piers, lighthouses, quay walls, and similar struc-
" tures, and for the sinking of mine shafts and wells."

The object of this invention is to ensure "the perpendicular " descent of such tubes, cylinders, or caissons, through soil of " varying density, and the avoidance of the necessity of using " heavy weight for forcing them down."

A series of iron tubes, cylinders, or caissons are grouped together, "or one large cylinder or other shaped chamber may " be used, dividing it into two or more parts or compartments, " which are rendered air tight excepting at the bottom or " mouth, and are furnished at the top with removable but " tight-fitting lids or covers bolted or otherwise secured " thereon. These cylinders are forced into the soil by atmo-
" spheric pressure, and are controlled in their descent by allow-
" ing more or less air to enter therein as required."

"If preferred, hydrostatic power may be employed for rais-
" ing the cylinders, or, if they be raised pneumatically or
" hydrostatically pistons may be introduced inside for more
" effectually securing the air or water, by which the pressure
" is brought to bear equally upon the lower strata inside the
" chambers and at the top of the same."

To aid in sinking the cylinders, they may be weighted, either by concrete, or by the weight of water.

[Printed, 4d. No Drawings.]

A.D. 1866, April 9.—No. 1008.

MACINTOSH, John.—(*Provisional protection not allowed.*)—
" Improvements in docks and apparatus connected therewith,
" parts of which are applicable to floating structures."

The object of this invention is "the construction of tempo-
" rary docks composed in part of flexible materials (such as
" sail cloth) forming a sort of bag or receptable filled with
" water, the contents of which being forced into a smaller
" space, its altitude is increased and a means obtained of float-
" ing vessels.

"The principle of the invention is likewise applicable to
" various other purposes, such as the raising or lowering of
" ships under various circumstances, the construction of double
" boats or vessels connected by a flexible diaphragm as a means
" of increasing their capacity for carrying goods or passengers,
" the crossing of rivers, the raising of ships, and such like
" structures."

[Printed, 4d. No Drawings.]

A.D. 1866, April 10.—No. 1022.

ROBOTHAM, William Douglas.—(*Provisional protection only.*)
—"Improvements in constructing the foundations and abut-
" ments of bridges, piers, jetties, retaining walls, and other
" similar works."

This invention chiefly relates to the construction of the above works which are built on bad and treacherous foundations.

For piers on bad foundations, when there are a number of arches sprung, the inventor screws four or other convenient number of piles, and erects thereon a standard which carries

rectangular boxes, "with a cap cast at the required angle "to take the brick or stone[1] arch or girder, as the case "may be, the end pier will in this case in a great manner be "in equilibrium, the thrust of the arch counteracting the "thrust of the 'muck.'"

Sometimes to the said rectangular box, with internal ties, are attached "plates of circular or curved shape, the arch of "the plate being for the purpose of meeting the 'muck' "thrown against it, the 'batter' being two to one and up-"wards."

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 9.—No. 1328.

GEDGE, William Edward.—(*A communication from Charles Nicoli.*)—(*Provisional protection only.*)—"An improved method "of and apparatus for preserving the banks of rivers and "watercourses or other embankments from corrosion or "wasting."

This invention consists of an apparatus composed of bricks or stone, "forming oblong cubes," "tied together by iron "rings, so as to form a network with which the part of the "bank which is to be preserved is covered to preserve it from "corrosion." The banks are cut to a gentle incline, regular and uniform; the network is then applied by commencing each transversal file or row at the top, and finishing it at the bottom at the water's edge when at the lowest. Each row is attached to piles driven into the earth, "both on the side "touching the water, and on the raised side or top of the "bank, as well as at the commencement and end of each "longitudinal row by means of iron rings, so that the net-"work, when entirely finished, is fixed all round. The bricks "or stones of rectangular form are arranged in parallel lines "both in the direction of the length and breadth, so that they "are side to side, and end to end, with more or less space "between them, but on an average about half an inch.

"The bricks or stones are then tied together both at the "ends and sides by iron rings, so as to make a network of a "length and breadth regulated by requirement, taking for "point of departure the highest level attained by the waters."

[Printed, 6*d*. Drawing.]

A.D. 1866, September 19.—No. 2407.

GEDGE, WILLIAM EDWARD.—(*A communication from Emilio Musciacco.*)—(*Provisional protection only.*)—" A new or improved " pneumatic steam dredging machine."

A boat to generate steam is employed in connection with a hopper boat to raise the sand or mud from the bottom of the water. The steam-generating boat has elbow pipes, one extremity of which is fixed to a cock on the hopper boat. The hopper boat has suction tubes, one on each side, also an air tube, and a lower sluice for delivering the collected material.

The hopper boat is anchored astern of the steam boat, the steam from which passes into the hopper boat, by the before-mentioned elbow pipes, until the hopper boat is filled with steam. On the air cock of the hopper boat being closed, the steam condenses and produces a vacuum in the hopper boat, thus causing the mud, sand, and gravel to rise into the hopper boat through the suckers. The cords, chains, and tubes of the loaded hopper boat being detached, it leaves for the spot where it is to discharge its load, and another is attached to the steam boat and loaded in a similar manner.

[Printed, 4*d*. No Drawings.]

A.D. 1866, October 22.—No. 2723.

KIRK, ALEXANDER CARNEGIE.—(*Provisional protection only.*)—" Improvements in steam dredgers."

"This invention has principally for its object to render " steam dredgers capable of being more easily manœuvred " than hitherto; and it consists in employing for that purpose " centrifugal or other pumping apparatus to be worked by the " main or separate engines, and to cause the projection by " suitable passages or orifices at the stern of one or more " streams of water. When the dredger is formed with one or " more wells for the endless chain or chains of dredging " buckets the inlet opening or openings for the access of water " to the pumping apparatus is or are situated at the after end " of such well or wells, but when the dredger has the buckets " at the sides the inlet opening is placed at the bow or for- " ward part. As it is of great importance to have the power " of turning and generally manœuvring such vessels indepen- " dently of the tug usually in attendance, deflectors or rudders

" are attached to the stern orifices through which the water " is projected, whilst to permit of reversing the direction of " propulsion either rotatory reversible pumps are used, or re- " versing valves are fitted to the water passages communicat- " ing with the pumping apparatus."

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 8.—No. 2910.

GEDGE, WILLIAM EDWARD.—(*A communication from Charles Nicoli.*)—(*Provisional protection only.*)—" An improved method " of and apparatus for preserving the banks of rivers and " watercourses, or other embankments from corrosion or " wasting."

This invention consists in an apparatus composed of bricks or stone " forming oblong cubes," " tied together by iron " rings so as to form a network with which the part of the " bank which is to be preserved is covered to preserve it from " corrosion."

The banks are cut to a gentle incline, regular, and uniform; the network is then applied by commencing each transversal row at the top and finishing it at the bottom at the water's edge when at the lowest. Each row is attached to stakes or piles " driven into the earth both on the side touching the " water and on the raised side or top of the bank, as well as at " the commencement and end of each longitudinal row by " means of iron rings, so that the network when entirely " finished is fixed all round. The bricks or stones of rect- " angular form are arranged in parallel lines both in the " direction of the length and breadth, so that they are side to " side and end to end with more or less space between them, " but on an average about ½ an inch. The bricks or stones are " then tied together both at the ends and sides by iron rings, " so as to make a network of a length and breadth regulated " by requirement, taking for point of departure the highest " level attained by the waters."

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 10.—No. 2931.

BONNEVILLE, HENRI ADRIEN.—(*A communication from Jean Louis Vergniais and Julien Appollinaire Chéron.*)—" An im- " *proved* apparatus to excavate, deepen, scour, and remove

"the mud, slime, sand, earth, shoal, gravel, stones, shingle, "or such like bodies out of harbours, havens, docks, creeks, "guts, bars, channels, watercourses, sluices, basins, lakes, "ponds, marshes, and similar places."

This apparatus is made up of two pump chambers, "the "valves, the packing of the pistons, and the sucking and "forcing tubes, and the piece fixed at the extremity of the "sucking tube of which are entirely new."

The drawings show two piston and cylinder pumps worked by cranks and connecting rods from a driving shaft. The valves are inclined, so as to close themselves by their own weight; their lower parts are at a certain distance from the edges of the pistons "to avoid that the accumulated sand, "stones, shingle, or other bodies prevent them from closing." The sucking and forcing tubes have knee-pieces which allow of the stretching of the said tubes horizontally and vertically "so as to place at a greater or lesser distance or height," the before-mentioned sucking tube towards the desired spot. The packing of the pistons is made with plaits or strings of cotton, in order to repel the sand and gravel. The sucker, at the extremity of the sucking tube, "consists of half a cylinder, "one of the ends of which is closed, the other end being "jointed to the sucking tube; the lower part is closed by a "perforated metal plate, which is placed on the matters to be "extracted." A ship or vessel is shown supporting instruments "by which the matters extracted are torn," also those for sounding purposes, and that part of the sucking tube furnished with a sucker and a metric scale, "the more or less "vivid immersion of which shows the degree of work done."

[Printed, 8*d*. Drawing.]

A.D. 1866, November 15.—No. 2999.

DAFT, Thomas Barnabas.—"Improvements in constructing "harbours."

These harbours can be built ashore, launched, and moored by cables coming ashore and over capstans; they may be connected with the shore by swivel bridges. The said harbours rise and fall with the tide, having hollow compartments for tha purpose. The compartments can receive water or other ballast. The hollow walls that form the harbour present a

large entrance, "as compared with the dimensions of the "inner harbour or water space. These harbours are to be "provided with machinery, which together with the means "of mooring will be suitable for changing the position of the "harbour to insure the mouth or entrance being in the most "favorable position according to the direction of the wind or "sea. These harbours in most cases are intended to be con-"structed of such dimensions as to suit the size of the vessels "they are to receive, the vessels being intended to fit and fill "them with only a sufficient clearance space between the "sides of the vessels and the interiors of the harbours to "admit of the vessels entering and clearing out without "jamming." The vessel has a self-acting mooring apparatus, namely, latches carried by the harbour catch into openings on the deck of the vessel.

When the position of the harbour is to be altered, pressure is taken off the ring guide which serves as a pivot, by means of the ram belonging to a hydraulic cylinder. A railway may proceed from the vessel across the bridge to any shore lines that may be desired.

These harbours may also be used for the protection of small craft, "and in this case it will often be convenient to have the "mouth at the side."

[Printed, 10*d*. Drawing.]

A.D. 1866, November 17.—No. 3025.

NEWTON, WILLIAM EDWARD.—(*A communication from Claudius Edward Habicht.*)—"Improvements in machinery for sub-"marine excavations."

"This invention consists in the combination of a friction "hoisting apparatus with a grasping bucket that is raised, "lowered, closed, or opened by the friction hoisting apparatus "acting through ropes or chains."

A barge or vessel contains an engine that (by means of wheels and a pin, lever, and key arrangement) actuates drums connected with chains to the boom that regulates the position of the grasping bucket. "The grasping bucket is formed of "two-quarter cylinder buckets, attached each by separate "joints to a metallic shoe piece at the lower ends of a pair of "vertical guide poles;" these guide poles slide as the bucket

is raised or lowered through eyes on the boom. One chain is to close the buckets by the action of jointed toggle arms; this is also the hoisting chain. The other chain opens the buckets; by this chain the bucket is lowered in an open position. When the bucket reaches the bottom, the hoisting chain is drawn upon, so as to close the bucket and gather within it the mud or other material. By continuing the pull upon the chain, the bucket and guide poles are drawn up vertically; the boom is then swung round, and the contents discharged into a barge by causing the friction drum to pull upon the other chain and open the bucket. "The vessel containing the machinery is to "be steadied while in use by a vertical stake or pole reaching "to the bottom of the water, and guy ropes may also be "employed for the purpose of aiding in steadying the "vessel."

[Printed, 10*d*. Drawing.]

A.D. 1866, December 29.—No. 3421.

SIMONS, William, and BROWN, Andrew.—"Improvements "in the arrangement and construction of dredgers."

1st. Combining together the steam dredger proper and the hopper barge. The aft or forward end of the hull of the dredger is formed of larger capacity than usual, so as to constitute "the hopper cavity or space into which the dredged material "is discharged from the buckets." As soon as the hopper is full, the bucket ladder is raised into the well, and the combined dredger and hopper is propelled to the place where it is desired to deposit the dredgings, "on arriving at which the "doors at the bottom of the hopper are opened and the con-"tents or 'dredgings' discharged, after which being effected "the doors are closed and the vessel returns to carry on the "dredging, for which purpose the bucket ladder is lowered as "before to continue operations."

2nd. So constructing the dredger "that it may be used, in "addition to the ordinary dredging operations, for the pur-"pose of excavating or cutting land above or at the surface "of the water, the sides of canals, rivers, embankments, and "coasts." The hull is formed with the well continued from midships or thereabouts right through the stern, so that the ladder and chain of buckets may be elevated "to any position

" required for cutting or excavating under any circumstance
A horizontal engine on board drives the chain of buckets
well as the gear for elevating or lowering the ladder. T
parts requiring removal may be undercut, "thus allowing t
" upper portions to break off or detach themselves throu
" their own weight, on which having fallen in the water t
" bucket ladder is lowered to raise it in the ordinary manne

[Printed, 1s. 4d. Drawings.]

INDEX OF SUBJECT MATTER.

[The numbers refer to the pages on which the Abridgments commence The names printed in *Italic* are those of the persons by whom the inventions have been communicated to the Applicants for Letters Patent.]

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1861	(215 „)	„ 7	0	„ 7	7
1862	(237 „)	„ 7	6	„ 8	2
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1861	(222 „)	„ 10	6	„ 11	2
1862	(240 „)	„ 11	6	„ 12	2
1863	(218 „)	„ 11	0	„ 11	8
1864	(220 „)	„ 11	0	„ 11	8
1865	(236 „)	„ 11	6	„ 12	2
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III.

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These books are of 12mo. size, and each is limited to inventions of one class only. They are so arranged as to form at once a Chronological, Alphabetical, Subject-matter, and Reference Index to the class to which they relate. Inventors are strongly recommended, before applying for Letters Patent, to consult the classes of Abridgments of Specifications which relate to the subjects of their inventions, and by the aid of these works to select the Specifications they may consider it necessary to examine in order to ascertain if their inventions are new. The *preface* of each volume explains (in most cases) the scope of the series of Abridgments which it contains.

The following series of Abridgments do not extend beyond the end of the year 1866. From that date the Abridgments will be found in chronological order in the "Chronological and Descriptive Index" (*see* Section II. of this List of Works). It is intended, however, to publish these Abridgments in classes as soon as the Abridgments of all the Specifications from the earliest period to the end of 1866 have appeared in a classified form. Until that takes place the Inventor (by the aid of the Subject Matter Index for each year) can continue his examination of the Abridgments relating to the *subject* of his invention in the Chronological and Descriptive Index.

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——— (*Great Northern Mecha- nics' Institute*).
——— (*Young Men's Christian Association*).
Dorchester (*County Museum and Library*).
———(*Working Men's Institute*).
Dudley (*Mechanics' Institution*).
Dukinfield (*Village Library and Reading Room*).
Dumbarton (*Philosophical and Lite- rary Society*).
Dumfries (*Mechanics' Institution*).

Dundee (*Young Men's Christian Association and Literary Institution*).
Durham (*Mechanics' Institute*).
Eagley, Bolton-le-Moors (*Library and Institute*).
Ealing (*Mechanics' Institute*).
Earlestown, Newton-in-Willows (*Mutual Improvement Society*).
East Greenwich (*Working Men's Institute*).
East Retford (*Literary and Mutual Improvement Society*).
Ebbw Vale (*Literary and Scientific Institute*).
Edinburgh (*Philosophical Institution*).
——— (*Royal Scottish Society of Arts*).
——— (*Subscription Library*).
——— (*Watt Institution and School of Art*).
——— (*Working Men's Club*).
Egham (*Literary Institute*).
Elswick (*Mechanics' Institute*).
——— (*Workmen's Institute*).
Exeter (*Devon and Exeter Albert Memorial Museum, School of Science and Art, and Free Library*).
——— (*Devon and Exeter Institution*).
Farnham (*Young Men's Association*).
Faversham (*Institute*).
Fowey (*Working Men's Reading Rooms*).
Frome (*Literary and Scientific Institution*).
——— (*Mechanics' Institution*).
Gainsborough (*Literary, Scientific and Mechanics' Institute*).
Garforth, near Leeds (*Working Men's Club*).
Glasgow (*Athenæum*).
——— (*Central Working Men's Club and Institute*).
——— (*Institution of Engineers in Scotland*).
——— (*Mechanics' Institution, Bath Street*).
——— (*Philosophical Society*).
Glastonbury (*Literary Institute*).
Godmanchester (*Working Men's Reading Room*).
Gosport (*Gosport and Alverstoke Literary and Scientific Institution*).
Grantham (*Public Literary Institution*).
Gravesend (*Gravesend and Milton Library and Reading Rooms*).
Guernsey (*Working Men's Association*).
Guildford (*Working Men's Institution*).
Hadleigh (*The Reading Room*).
Halesworth (*Mechanics' Institute*).
Halifax (*Literary and Philosophical Society*).
——— (*Mechanics' Institute*).
——— (*Working Men's College*).
Halstead (*Literary and Mechanics' Institute*).
Haslingdon (*Institute*).
Hastings (*Literary and Scientific Institute*).
——— (*Mechanics' Institution*).

[illegible] (*Literary Institution*).
Hebden Bridge, near Todmorden (*Mechanics' Institution*).
Helston (*Reading Room and Library*).
Hemel Hempstead (*Mechanics' Institute*).
Hereford (*Natural History, Philosophical, Antiquarian, and Literary Society*).
Hertford (*Literary and Scientific Institution*).
Heywood (*Mechanics' Institute*).
Hitchin (*Mechanics' Institute*).
Holbeck (*Mechanics' Institution*).
Hollinwood (*Working Men's Club*).
Holt, Norfolk (*Literary Society*).
Holywell Green (*Mechanics' Institution*).
Horncastle (*Mechanics' Institution*).
Huddersfield (*Mechanics' Institution*).
Hull (*Church Institute*).
—— (*Literary, Scientific, and Mechanics' Institute*).
—— (*Lyceum Library*).
—— (*Royal Institution, Albion Street*).
—— (*Young People's Institute*).
Huntingdon (*Literary and Scientific Institution*).
Ipswich (*Working Men's College*).
Kendal (*Christian and Literary Institute*).
—— (*Highgate Mechanics' Institute*).
——— (*Working Men's Institute*).
Kidderminster (*Mechanics' Institute*).
Lancaster (*Mechanics' Institute and School of Science*).
Lee, Kent (*Working Men's Institution*).
Leeds (*Chapeltown Branch Library*).
——— (*Church Institute*).
——— (*Holbeck Branch Library*).
——— (*Hunslet Branch Library*).
——— (*Leeds Library*).
——— (*Mechanics' Institution and Literary Society*).
——— (*Philosophical and Literary Society*).
——— (*Working Men's Institute*).
——— (*Young Men's Christian Association*).
Leek, Staffordshire (*Literary and Mechanics' Institution*).
Leicester (*Law Society*).
———— (*Young Men's Christian Association*).
Leighton Buzzard (*Working Men's Mutual Improvement Society*).
Leith (*Mechanics' Subscription Library*).
Lewes (*Fitzroy Memorial Library*).
——— (*Mechanics' Institute*).
——— (*School of Science and Art*).
Lincoln (*Mechanics' Institute*).
Liverpool (*Institute*).
———— (*Medical Institution*).
———— (*Polytechnic Society*).
Llanelly (*Chamber of Commerce and Reading Room*).
Lockwood (Mechanics' *Institution*).

London (*Albert Working Men's Club, Knightsbridge*).
——— (*Bank of England Library and Literary Association*).
——— (*Beaumont Institute, Mile End*).
——— (*Bedford Working Men's Institute, Spitalfields*).
——— (*Birkbeck Institution, Southampton Buildings, Chancery Lane*).
——— (*Bow and Bromley Road Institute, Bow Road*).
——— (*Bow Common Working Men's Club, Devon's Road, Bow Common*).
——— (*Christchurch Working Men's Club, New Street Lark Hall Lane, Clapham*).
——— (*Clerkenwell Club, Lower Rosoman Street*).
——— (*Holloway Working Men's Club and Institute, Holloway Road*).
——— (*Literary and Scientific Institution, Walworth*).
——— (*London Association of Foremen Engineers and Draughtsmen*).
——— (*London Institution, Finsbury Circus.*)
——— (*London Library, St. James'*).
——— (*Royal Institute of British Architects, Conduit Street, Hanover Square.*)
——— (*St. James and Soho Working Men's Club, Rupert Street, Soho*).
——— (*St. Mary Charterhouse Working Men's Club, Golden Lane*).
——— (*South London Working Men's College, Blackfriars Road*).
——— (*Southwark Working Men's Club, Broadwall, Stamford Street*).
——— (*Working Men's Club, Brixton Hill*).
——— (*Working Men's Club, St. Mark's, Victoria Docks*).
——— (*Working Men's Club and Institute, Battersea*).
——— (*Working Men's Club and Institute Union, Strand*).
——— (*Working Men's Club, Triangle, Hackney*).
——— (*Working Men's College, Great Ormond Street*).
Longwood (*Mechanics' Institution*).
Lowestoft (*Library and Reading Room*).
Lye (*Institution*).
Lymington (*Literary Institute*).
Madeley, Shropshire (*Anstice Memorial, Workmen's Club and Institute*).
Maidstone (*St. Paul's Literary Institute*).
——— *Working Men's Club and Institute.*)
Maldon, Essex (*Literary and Mechanics' Institute*).
Manchester (*Ancoats Branch Free Library*).
——— (*Athenæum*).
——— (*Campfield Free Lending Library*).
——— (*Cheetham Branch Library*).
Manchester (*Chorlton and Ardwick Branch Free Library*).
Manchester (*Hulme Branch Free Library*).
——— (*Law Library*).
——— (*Mechanics' Institution*).
——— (*Natural History Museum, Peter Street*).
——— (*Owen's College*).
——— (*Portico Library, Mosley Street*).
——— (*Rochdale Road Branch Free Library*).
——— (*Royal Exchange Library*).
——— (*Scientific and Mechanical Society*).
Manningtree (*Manningtree and Mistley Literary and Scientific Institution*).
Mansfield (*Co-operative Industrial Society*).
——— (*Mechanics', Artizans', and Apprentices' Library*).
——— (*Mechanics' Institute*).
Marlborough (*Reading and Mutual Improvement Society*).
——— (*Working Men's Hall*).
Melksham (*Mutual Improvement Society*).
Melton Mowbray (*Literary Institute*).
Mere, near Bath (*Literary Association*).
Middlesborough (*Iron and Steel Institute*).
——— (*Mechanics' Institution*).
Middlewich (*Literary and Scientific Institution*).
Modbury (*Mechanics' Institution*).
Mossley (*Mechanics' Institute*).
Newark (*Mechanics' Institute*).
Newbury (*Literary and Scientific Institution*).
Newcastle-upon-Tyne (*Mechanics' Institution*).
——— (*Working Men's Club*).
New Mills, near Stockport (*Mechanics' Institute*).
Newport, Isle of Wight (*Young Men's Society and Reading Room*).
Northampton (*Mechanics' Institute*).
North Shields (*Free Library*).
Nottingham (*Mechanics' Institution*)
——— (*Subscription Library, Bromley House*).
Oldham (*Mechanics' Institution, Werneth*).
Ormskirk (*Public Library*).
Oswestry (*Institute*).
Over, Cheshire (*Working Men's Institute*).
Oxford (*North Oxford Working Men's Club*).
Patricroft (*Mechanics' Institution*).
Pembroke Dock (*Mechanics' Institute*).
Pendleton (*Mechanics' Institution*).

Penzance (*Institute*).
——— (*Penzance Library*).
——— (*Working Men's Association*).
Perth (*Mechanics' Library, High Street*).
Peterborough (*Mechanics' Institution*).
Plymouth (*Working Men's Institute*).
Pontypool (*Literary Institute*).
Poole (*Literary and Scientific Institution*).
——— (*Mechanics' Institute*).
Port Glasgow (*Public Library*).
Portsea Island (*Young Men's Christian Association*).
Preston (*Institution for the Diffusion of Knowledge*).
Redruth (*Redruth Institution*).
Reigate (*Mechanics' Institution*).
Richmond (*Working Men's College*).
Rotherham (*Rotherham and Masbro' Literary and Mechanics' Institute*).
Royston (*Institute*).
Rusholme (*Public Hall and Library*).
Ryde, Isle of Wight (*Philosophical and Scientific Society*).
——— (*Young Men's Christian Association and Literary Institute*).
Saffron Walden (*Literary and Scientific Institution*).
St. Just (*Institution*).
St. Leonards (*Mechanics' Institution*).
——— (*Working Men's Club*).
Salford (*Working Men's Club*).
Salisbury (*Literary and Scientific Institution*).
Saltaire (*Literary Institute*).
Scarborough (*Mechanics' and Literary Institute, Vernon Place*).
Selby (*Mechanics' Institute*).
Sevenoaks (*Literary and Scientific Institution*).
Shaftesbury (*Literary Institution*).
Sheerness (*Literary Institute*).
Sheffield (*Branch Free Library*).
——— (*Brightside Branch Library*).
——— (*Literary and Philosophical Society, School of Arts*).
——— (*Mechanics' Institution*).
Shepton Mallet (*Reading and Mutual Improvement Society*).
Sidmouth (*Mechanics' Hall*).
Skipton, Yorkshire (*Mechanics' Institute*).
Slough (*Mechanics' Institute*).
Smethwick, Staffordshire (*Library, Reading Room, and Literary Institute*).
Southampton (*Polytechnic Institution*).
——— (*Workmen's Hall*).
Southport (*Athenæum*).
South Shields (*Public Free Library*).
Southwell (*Literary Institution*).
Spalding (*Mechanics' Institute*).
——— (*Christian Young Men's Association*).
Stafford (*Mechanics' Institution*).
Staines (*Literary and Scientific Institution*).
Staines (*Mechanics' Institute and Reading Room*).
Stalybridge, Cheshire (*Mechanics' Institution*).
Stamford (*Institution*).
Stourbridge (*Associated Institute*).
——— (*Church of England Association*).
——— (*Iron Works Reading Room and Library*).
——— (*Mechanics' Institution*).
——— (*Working Men's Institute*).
Stowmarket (*Literary Institution*).
Stratford (*Working Men's Hall*).
Sudbury, Suffolk (*Literary and Mechanics' Institute*).
Sunderland (*Working Men's Club*).
Swansea (*Royal Institution of South Wales*).
——— (*South Wales Institute of Engineers*).
——— (*Working Man's Institute*).
Tavistock (*Mechanics' Institute*).
——— (*Public Library*).
Thornton, near Bradford (*Mechanics' Institute*).
Thornton Heath, Croydon (*Workmen's Club*).
Todmorden (*Mechanics' Institution*).
Truro (*Cornwall County Library*).
——— (*Institution*).
——— (*Royal Institution of Cornwall*).
Tunbridge (*Literary and Scientific Institute*).
——— (*Mechanics' Institute*.)
Tunbridge Wells (*Mechanics' Institution*).
——— (*Society of Literature and Science*).
Turton, near Bolton (*Chapel Town Institute*).
Tynemouth (*Free Public Library*).
Ulverston (*Temperance Hall*).
Uttoxeter (*Mechanics' Literary Institute*).
Uxbridge (*Uxbridge and Hillingdon Reading and Newsroom Institute*).
Wakefield (*Mechanics' Institute*).
Wallingford (*Free Library and Literary Institute*).
Walsall (*Free Library*).
Walsham-le-Willows, Suffolk (*Institute*).
Ware (*Institute*).
Warminster (*Athenæum*).
Watford (*Literary Institute*).
Wellingborough (*Working Men's Club*).
Wellington (*Young Men's Christian Association*).
Wells, Somerset (*Young Men's Society*).
West Bromwich (*Free Library*).
Whaleybridge (*Mechanics' Institute*).
Whitby (*Institute*).
——— (*Museum*).
——— (*Subscription Library*).
Whitehaven (*Mechanics' Institute*).
——— (*Working Men's Reading Room*).

Whitstable (*Institute*).
Wilton (*Literary Institute*).
Winchester (*Mechanics' Institution*).
——— (*Training College*).
Winsford (*Town Hall Reading Room*).
Wirksworth (*Mechanics' Institution*).
Wisbeach (*Mechanics' Institute*).
Witham (*Literary Institution*).
Witney (*Athenæum*).
Wolverhampton (*Law Library*).
——— (*Library*).
Wolverton (*Institute*).
Woodbridge (*Literary and Mechanics' Institute*).
Worcester (*Railway Literary Institute*).
——— (*Workman's Hall*).
Workington (*Mechanics' Institute*).
Yarmouth, Great (*Parochial Library and Museum*).
Yeovil (*Mutual Improvement Society*).
York (*Church Institute*).
——— (*Institute of Popular Science, &c.*)
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Guildford (*Mechanics' Institute*).
Ipswich (*Mechanics' Institute, Tavern Street*).
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Leominster (*Literary Institute*).
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——— (*House of Commons*).
London (*Hon. Soc. of Gray's Inn*).
——— („ „ *Inner Temple*.
——— („ „ *Lincoln's Inn*).
——— („ „ *Middle Temple*).
——— (*Aeronautical Society*).
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——— (*Guildhall Library*).
——— (*Institution of Civil Engineers*).
——— (*Odontological Society*).
——— (*Royal Society*).
——— (*Society of Arts*).
——— (*United Service Museum*).
Manchester (*Literary and Philosophical Society, George Street*).
——— (*Mechanics' Institution, David Street*).
Newcastle-upon-Tyne (*North of England Institute of Mining Engineers*).
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Oxford (*Bodleian Library*).
Stretford, near Manchester (*Mechanics' Institute*).
Swindon, New (*Mechanics' Institute*).
Tamworth (*Library and Reading Room, George Street*).
Yarmouth, Norfolk (*Public Library, South Quay*).

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Russia—Imperial Technological Institute, St. Petersburg.
Turkey—Literary and Scientific Institute, Smyrna.
Victoria—School of Mines, Ballaarat.
United States—American Academy of Arts and Sciences, Boston.
——— American Institute, New York.
United States.—American Society of Civil Engineers, New York.
——— Industrial University Champaign, Illinois.
——— Mechanics' Institute, San Francisco.
——— Mercantile Library Association, Pittsburgh, Pennsylvania.
——— Odd Fellows' Library Association, San Francisco.
——— Smithsonian Institute, Washington.
——— Wabash College, Crawfordsville, Indiana.
——— Young Men's Christian Association, Scranton, Pennsylvania.

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following is a KEY to the classes already published. The
refer to the list of Abridgments on pages 5 and 6, where the
s, prices, &c., are given :—

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D.

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